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ABSTRACT

The six articles in this journal issue were all designed to provide an objective presentation of the framework within which the European Centre for the Development of Vocational Training (CEDEFOP) is charting a course toward establishing a common training policy and creating a single market in 1993. The first article, "Information on Qualifications" (Enrique Retuerto), discusses the need for a reference framework of what each qualification means in terms of the skills required by an occupation. A paper called "The Recognition and/or Comparability of Non-University Vocational Training Qualifications in the Member States of the European Communities" (Burkart Sellin) examines the inherent possibilities and requirements of a European Community general regulation on mutual recognition. "Mastering Metals--Problems in Analysing and Classifying 'New' Technical Jobs in Metalworking" (Peter Grootings et al.) reflects the present state of work in this area. "A European Directory of Occupational Profiles" (Peter Grootings) offers some notes about the concepts, methodology, and organization of the directory. "Study of Occupational Profiles in the Electronics Sector" (Gumersindo Garcia Arribas) presents results of a pilot study in Spain. Finally, William McDerment's paper, "Some Reflections on Education and Training," comments on the need for vocational training, training to allow mobility within the Community Member States, and preparing for the future. A protocol entitled "Council Decision on the Comparability of Vocational Training Qualifications between Member States of the European Community" concludes the document. (YLB)

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Europe: a labour market without frontiers

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Contents

Page

Dear Readers 1

Information on qualifications 2
Enrique Retuerto

The recognition and/or comparability of non-university vocational training qualifications in the Member States of the European Communities 5
Burkart Sellin

Mastering metals — Problems in analysing and classifying 'new' technical jobs in metalworking 11
Peter Grootings, Bryn Jones, Peter Scott

A European directory of occupational profiles 21
Peter Grootings

Study of occupational profiles in the electronics sector 25
Gumersindo García Arribas

Some reflections on education and training 34
William G. McDerment

Information sources

Council Decision of 16 July 1985 40

List of organizations supplying information in each Member State 44

Annex

Official Journal of the European Communities No C 209/89

Dear Readers,

The studies on vocational training are a new branch in a sector situated at the intersection of several traditional disciplines such as sociology, the work sciences and the educational sciences. At the same time they are closely linked to technological developments and the laws governing the supply and demand markets for goods and services, and they are intimately related to the history and the culture of each country if not of each region.

In view of all these factors, the Community is confronted with the challenge of trying to harmonize and approximate all these components with the aim of establishing a common training policy and taking the important step of creating the single market on 1 January 1993. Since its inception CEDEFOP has been active in this field, trying to improve knowledge of the functioning of the vocational training systems in each Member State and their permanent evolution due to the influence of new technology on employment and the content of jobs — a goal which is also a reflection of the legitimate aspirations of the workers who wish to improve their living conditions and their quality of life in a modern Europe.

The Council of Ministers took a major step in this direction with its Decision of 16 July 1985 on the comparability of vocational training qualifications between the Member States, particularly when it referred to the Council Resolution of 2 April 1963 on the establishment of the general principles for the implementation of a common vocational training policy in the Member States.

The goal envisaged in this Decision still holds, namely, to enable workers to make better use of their attested qualifications in order to find a job adapted to their training. Thanks to the work undertaken by CEDEFOP, under the political aegis of the European Commission, the first results have been published in the Official Journal in 1989 (OJ C 168 and C 166) and an information sheet has been published (OJ C 209) in the 'Communications' series (see Documentation).

It is now up to the Member States to name the relevant agencies which will be responsible for dissemination. It is planned to extend this measure to cover all occupations at skilled worker level (the Commission, with CEDEFOP's technical and scientific assistance, will do everything in its power to achieve this objective before 1993).

This question may appear to be simple, but in reality it is one which involves extremely complex aspects because a vocational qualification is made up of several components: life skills and know-how, training, qualification, work experience, certificates, etc. There are already many studies on this subject. But the level at which these qualifications are applied also consists of several variables including that of vocational training.

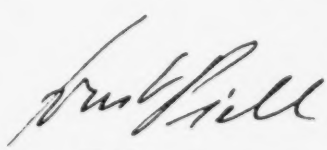
A brief explanation may help!

One may say that, in the 12 Member States, the same raw materials are used to produce a product or a service. Furthermore, the manufacturing processes are similar and the combination of tools and machines is virtually identical. (Is it not true that some manufacturers of machine-tools or office machines more or less have a world monopoly?)

From the design stage of a product or a service up to its availability on the market, it is necessary to make use of a sum total of qualifications which is practically the same in all the countries. It is in the distribution of skills among individuals that the differences in each country, each region or even each firm become apparent. One may draw the conclusion that tasks are divided according to a work organization established by the firm on the basis of the qualifications available on the labour market. In the last few years we have been witnessing a very interesting development which we may call the beginning of a 'post-Taylorism' era. Obviously, this process is accelerated by the introduction of new technologies which produce new forms of work organization. We can observe new strategies for the products and the market and the emergence of new occupations which, contrary to what happened in the past, are not necessarily a rearrangement of existing qualifications, but are new qualifications, new skills, possessed by a new type of worker. The training systems differ in each Member State and we are witnessing the emergence of a whole range of new training paths running parallel to the traditional training channels; this shows that the world of training is undergoing a process of radical change and that the occupations covered by training are being totally restructured.

In this issue we have tried to give an objective presentation of the framework within which CEDEFOP is charting a course in this important field with the aim of supporting the Commission and political decision-makers faced with the difficult problem of training men and women for the Europe of tomorrow.

The last article in this issue has been written by our colleague, William McDerment, who was the first editor of the CEDEFOP bulletin and who is now leaving us. We would like to wish him luck and success in his new sphere of work and thank him for the great contribution he made as the first man in charge of the vocational training bulletin.



Ernst Piehl
Director,
CEDEFOP

Information on qualifications

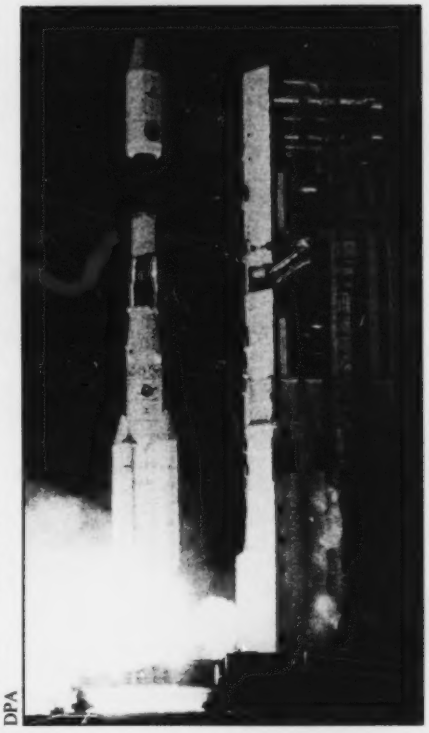
An important variable for vocational training at Community level

It is becoming more and more difficult to quantify the forecast of trends on vocational qualification markets. On the other hand, a worker in his daily life is inundated with a mass of information which profoundly influences his vocational orientation.

The contents of work are now subject to the great influence of the overwhelming presence of information elements, whereas traditionally, they were governed by mechanical operations; the processing and transmission of information, together with the necessity of product innovation, are the essential features which determine the requirements of vocational qualification today.

In terms of employment, the new capital/labour ratio keeps large numbers of workers out of the game. The paradigm of one worker for one job is now a thing of the past.

If, in addition to the decline in the volume of employment and the growing intellectual curiosity of citizens who are being bombarded with information, we examine the accumulation of all these factors, the following assumption emerges: if the worker is to maintain a coherent relationship between his personal world (which affects his skills) and his professional know-how (which changes in keeping with technological demands and work organization), there must be a flexible response from the mechanisms providing qualification — or, if one prefers, the education and vocational training systems.



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If this is not the case, the result is a growing discrepancy between a variety of conceptions of vocational skill requirements and a relatively rigid supply of knowledge and know-how.

Thus, for each worker the gap between the personal world and the professional world, or the world of work, will widen more rapidly the less his ability to adapt to his working environment.

This assumption is still valid today if we take a look at the erratic wanderings of the worker through the subsystems of technical education and vocational training, and relate them to the demands of employers for occupational profiles with a broad educational basis and a wide range of vocational know-how (or experience). Long-term unemployment and the precarious employment situation of young people with inadequate technical training are two dramatic and common manifestations of both these facts.

If we continue with a linear development of these assumptions we see that there is a necessity in vocational training to introduce programmes which consist of knowledge and know-how covering the marginal areas or complete phases of productive processes but not just fragments of them. These programmes will have to be combined with the individual (social) need for broader-based or more wide-ranging knowledge and skills; a combination which will, however, be extremely difficult if one considers how arbitrary and rigid the provision of vocational training is in many of the Community territories.

But, as technical bodies like CEDEFOP have the task of presenting proposals to improve the existing situation, we can start by excluding what is inadequate. The appropriate responses to the new demands of qualification cannot be found either in the paradigm of reproducing the place of work in the training course or by getting the social partners to agree on specific programmes which are tailored to their respective needs.

Given the demands on the present employment markets originating from the new situations in the execution of the job, where the rotation of the workers, their creativity, the capacity to interpret data and take decisions, are starting to play an increasingly important role, the references to the codes and classifications of traditional jobs are losing their relevance (even if we admit that they continue to produce high employment figures). On the contrary, it is now necessary to think in terms of transversal vocational skills and information blocks which can be applied over a relatively wide and varied range of work processes.

Summing up, the line of analysis followed leads us to a configuration containing the following dominant factors: product as against production process, processing of information as against mechanical or repetitive skills, and an urgent demand for qualifications which will facilitate an understanding of the global system in which each job is embedded.

Enrique Retuerto
Deputy Director
CEDEFOP

In the specific context of vocational training, a new approach taken by the planners of training (in the firm and in the public services) tries to place the worker as a qualified professional with a specific level of specialization within an occupational group dealing with work processes viewed horizontally in their totality. The previous model divided each part of the process vertically in a rising sequence of complexity. This technical system provided the foundation for a hierarchization which in turn maintained the system.

In this approach which is a part of the reform of vocational qualifications, the skills or abilities are attached in blocks to autonomous phases of the whole work process, and they thus lead to multifunctional occupational profiles.

This type of analysis makes it possible to define the qualification of a worker not so much in terms of specific tasks but in relation to the whole (or a part) of his knowledge (defined in blocks), practical experience and attitudes which make up his professional background and which **can be adapted on the basis of specific models of organization to certain functions in different production processes.**

What approach should the Community follow so that qualifications — those of the past and those in the process of change — become comprehensible and comparable when workers stand on an equal footing? What action can one take so that equality of treatment at the place of work results from the description (if not the 'proof') of the qualification of a worker?

CEDEFOP has focused two of its study projects on the establishment of common denominators which will help to make the competence or vocational skill demanded by an employer correspond to the abilities or the qualification held by a worker seeking employment.

This is an arduous technical undertaking which relates groups of tasks to each vocational training certificate. An arduous task because the activities involved in the occupation differ depending on the country, the type of enterprise and pre-existing agreements, and because the levels which are attested by the certificates will vary in direct relation to the dimension (duration, content ...) of the training which is being certified.

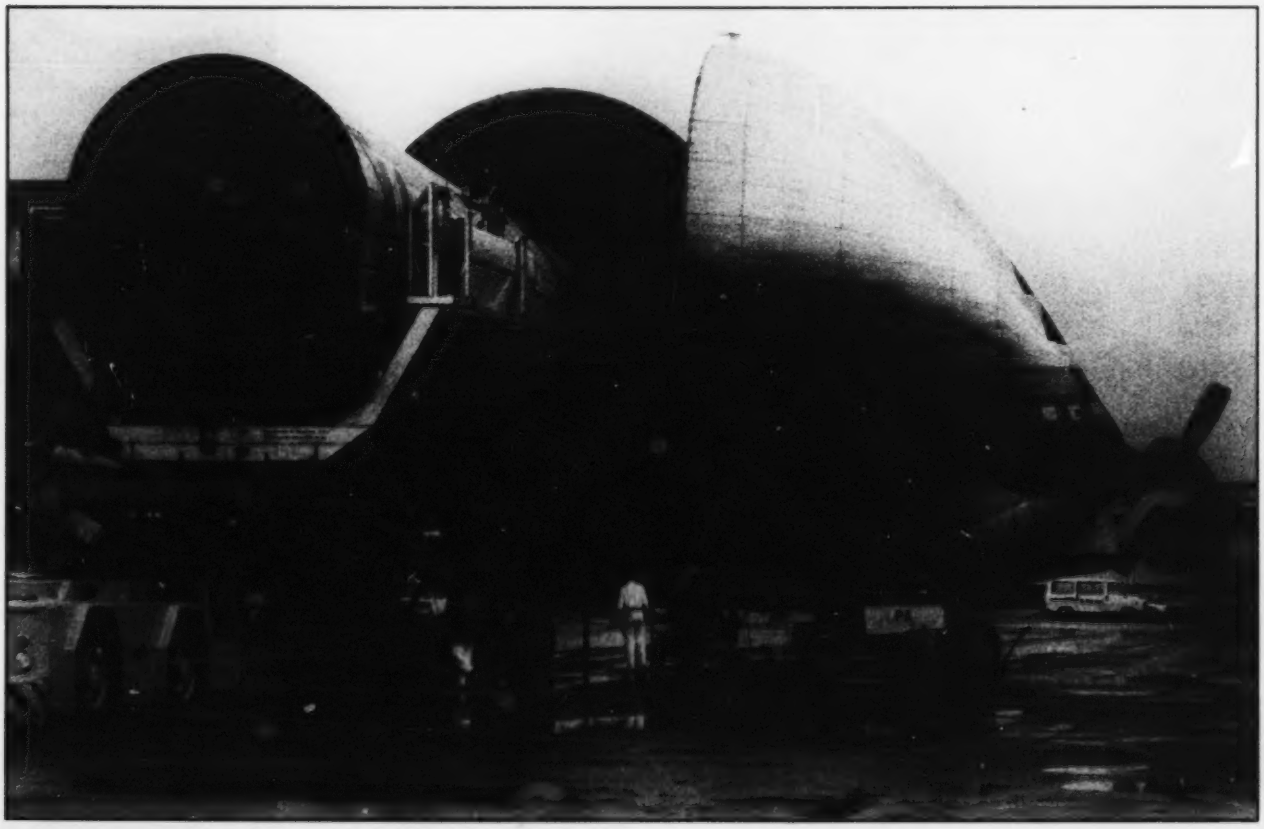
There is another study which is more scientific in nature, more abstract, which deals with perspectives with the aim of identifying in this diverse and dispersed reality those blocks of skills and knowledge in which a demand for qualification and the supply of qualification 'converge with and correspond to one another'.

Details of these studies will be presented in several articles in this issue. In our analysis we would like to stress the following:

(a) The comparison of training certificates on the basis of the activities to be undertaken by the worker holding them is useful when it is necessary to compare existing situations which affect large numbers of workers who wish to get information on the corresponding situation at their levels of qualification (attested by these certificates) in the other countries.

(b) The mutual adaptation of commonly accepted job profiles (in 12 countries) and the profiles of occupational groups which are either undergoing radical change or are not sufficiently covered by existing agreements, can serve as a point of reference for the skills demanded in the different countries.

(c) Furthermore, the approximation between the workshop and the job, the in-



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troduction of information techniques (creation, processing and transmission of data) in production and the intangible factors which are exerting a growing influence on the assessment of a qualification, make it necessary to treat the contents of this qualification in more ways than just a description of activities; in other words, define them in terms of functional areas and successively translate them into knowledge and attitudes.

(d) Both the comparability of titles and certificates, and the establishment of the knowledge, know-how and attitudes required for the different occupational categories, will have to be worked out by the agents and actors of vocational training (workers, employers and the providers of training). If the levels of qualification and the certificates are already governed by legal provisions or agreements, this task will more or less be an administrative one; if no such regulations exist, the agreements on qualification levels will necessarily have to be based on a detailed identification of the skills required for each occupational profile and will be the second step in the process (the agreement on levels cannot precede the agreement on contents).

(e) However, the guarantee of the recognition of a qualification in each Member State cannot be ensured by the results derived from individual studies; what is really needed by employers, workers and the organizers of training is a **reference framework** for comparison (and perhaps harmonization in the course of time) **of what each qualification means in terms of the skills required for the exercise of an occupation or a part of it.**

This is the goal envisaged by CEDEFOP in its technical work and this is the subject of this issue of the bulletin.

The recognition and/or comparability of non-university vocational training qualifications in the Member States of the European Communities

Interim report
January 1989

Burkart Sellin
Coordinator for the CEDEFOP project 'Comparability of vocational training qualifications'

I — Objectives of the interim report

It is the aim of this paper to examine the inherent possibilities and the requirements of a Community-wide general regulation on the mutual recognition of non-university vocational training qualifications and related questions.

Following the directive on a general system for the recognition of higher-education diplomas which was adopted by the Council in December 1988, the question arises whether and under what conditions a similar general regulation can be proposed for the other vocational training qualifications (see Directive in the Annex).

The next issue to be examined in this context is the possibility or desirability of further developing the procedure and the results of the work undertaken by the European Commission and CEDEFOP in the field of comparability of vocational training qualifications (see 'Information sources' for Council Decision of 16 July 1985).

In addition to these two approaches which have the aim of improving, directly or indirectly, conditions for the free movement of persons, the right of establishment and a free services market, another question arises with regard to the possibility of:

- establishing Community-wide definitions of occupational profiles, i.e. know-how, abilities and skills, as a common reference framework for the development and approximation of training structures and content, for example, along the lines of the results obtained from the work on comparability of vocational training qualifications;
- following this, establishing a nomenclature of vocational qualifications and designations recognized throughout Europe, with due consideration of the experience gained with the Sedoc classification system and with the aim of making a contribution to the development of a European employment market.

II — Analysis of past work and its potential for extension

1. Development potential of the 'general directive' approach

The general directive mentioned in Section I has the advantage of being generally applicable; it is a legally binding document which has to become national law within two years. It tackles the problem primarily from the legal angle and can therefore give the employees and employers or services concerned in the Member States little concrete information for the purpose of implementation on:

- comparable occupations and/or disciplines in the other Member States;

■ the designations of comparable certificates or training centres.

In practice persons seeking employment will still have difficulties in getting their certificates and training qualifications accepted, and the responsible authorities will continue to reserve the right of examining each individual case, irrespective of the exception clauses in the directive on aptitude tests and/or periods of professional experience which may be requested as additional requirements. Without wishing to cast doubt on the prospects of success, it is apparent that further steps will have to be envisaged if the expectations aroused are not to be disappointed:

(a) The general directive on the vocational training qualifications of higher-education institutions only deals with the so-called 'regulated occupations', i.e. the occupations for which legal or publicly proclaimed conditions of access exist, e.g. lawyers, teachers, structural engineers (civil engineers), etc. For all other occupational activities in the private or semi-public sector this approach provides no yardsticks for comparison, even though in these sectors there are often conditions for recruitment which correspond to access requirements laid down by the State or which have been derived from them.

(b) It will be necessary to draw up comparative tables on the disciplines and/or existing occupational specialization plus a Community-wide definition of occupations; national vocational specialization could then be classified within these tables.

(c) Based on this, occupational group-specific directives could then be developed or concrete references could be made to corresponding certificates or vocational training qualifications as an extension of the general directive. Parallel to this, the recognition of study periods and the eligibility to study further, i.e. with the inclusion of academic equivalence, which is not guaranteed through the abovementioned directive, could be regulated. [1]

(d) Educational and occupational research in several Member States has repeatedly shown that there is an interdependence between the type and structure of the educational or training systems and the design and structure of the employment systems: the existence of formal training routes has an influence on the patterns of recruitment behaviour of companies and public services and this provides feedback on the contents and organization of training. Even if there is no formal dependence between the two subsystems, there are important informal forms of dependence which have an impact on the effective assessment of educational certificates and are manifested in the staffing policy of the companies and in the status assessment of persons who have completed certain training courses. These interrelations are generally not publicly sanctioned (through regulations), but a semi-public sanction is given through professional associations, trade unions, guilds and/or chambers. Some of them — although not all and not in all Member States — have a legal mandate to sanction these relationships. Expressed in figures, the number of such non-regulated occupations will probably be much greater than the number of regulated occupations in the Member States.

2. A 'general directive' for non-university vocational training qualifications

With respect to the eventual extension of the 'higher-education directive' to cover non-university vocational training qualifications (see Levels 1, 2, 3 and 4, Annex of Council Decision of 16 July 1985), the following observations may be made:

(a) The number of 'regulated occupations' is much smaller and the number of non-regulated occupations much greater than at university level. The regulation generally deals only with individual parts of the qualification such as:

■ eligibility requirement;

■ the requirements for establishment as a self-employed person or setting up a business;

■ the authorization to undertake specific welding or electrical tasks, or to operate specific vehicles or machines, etc.;

■ certain health, sex or physical attributes (e.g. in building trades, in educational or paramedical occupations).

An entire occupation is regulated only in exceptional cases, e.g. teacher, social worker, etc.

This means that a directive which only or primarily covers the so-called 'regulated occupations' would have a limited impact on non-university occupations.

(b) If the Member States do not introduce formal recognition of these occupations at national level, then the chances of implementing this at EC level are scant. However, this situation differs in the case of 'academic' recognition of certain training courses and certificates through State or public bodies. This type of recognition can be granted in different ways:

■ through direct recognition of training institutions;

■ through recognition of the curricula of these institutions;

■ through recognition of the final examinations of certain providers of training, either by the responsible administrations or by guilds, chambers, professional associations and trade unions which have a legal mandate to grant this recognition.

Such recognition can be given at different levels of State intervention — national, regional or local, depending on the degree of independence of the regional or local authority — or through specific sectors or occupational groups.

However, this type of recognition which is mainly academic and/or professional, only has a limited effect on the staffing or recruitment policy of the companies in the private or non-public sector (see Section II, paragraph 1 (d)), at least, as long as there are no sectoral or occupational group-specific or individual-company collective agreements, i.e. collective wage agreements or company agreements between employee and employer organizations which specifically include these certificates.

(c) For the reasons mentioned above, such a regulation, whether it is a directive or an EC resolution or decision, will have to give due consideration to the rights of the employers and employees and their organizations which are mostly autonomous in their decisions on the assessment of qualification in their companies of sectors. Pure State regulations which have been passed without the participation — or inclusion of the rights — of the social partners, hardly have a chance of being applied if the State refrains from intervening in the labour relations and the staff policy of the companies. Most non-university workers are

[1] The judgments pronounced by the European Court of Justice — Case 293/83 *(Gravier)* and Case 152/82 *(Forcheri)* — show that the EC is entitled to include aspects of academic equivalence in its regulatory mechanisms.

paid according to the collective agreement and are classified — not compulsorily but often — according to their qualification. So the important thing here is to enable employees and employers and their organizations to accept or apply comparable qualifications in a possibly equal manner in all Member States by improving their knowledge of existing vocational training certificates on the EC employment market and the training systems underlying them. This can be done only if the Member States have confidence in the comparable training certificates issued by the other Member States, and the training levels gradually approximate one another despite different institutional conditions and structures. It is only on this basis that discrimination which may continue to exist can be removed.

3. Development potential of the 'comparability' approach

This approach which is included in the Council Decision of July 1985 has been profoundly influenced by the participation of the social partners, as seen in Section II, paragraph 2 (a), through the

- inclusion of the Advisory Committee for Vocational Training of the European Commission; and
- preliminary technical work and methodical surveys to be undertaken by CEDEFOP,

in the pre-Decision phase.

Both bodies mentioned above are institutions in which the social partners are represented along with the governments. In the implementation of decisions too, they are aided by sector-specific or occupational group-specific expert groups whose composition is normally tripartite and whose members are appointed by the Member States, the Commission and CEDEFOP. It is the intention of the Decision to establish the comparability of vocational training qualifications 'with the aim of enabling workers to make better use of their qualifications, in particular for the purposes of obtaining suitable employment in another Member State' (see Article 1). In doing this the Council has veiled its intentions in very reserved legal terms and has stressed that it only intends to expedite 'common action by the Member States and the Commission to establish the comparability of vocational training qualifications in the Community and improved information on the subject'. At the same time the scope has been limited to Level 2 of the Structure of training levels given in the Annex of the Decision, i.e. the level of skilled workers and skilled employees.

Thus, the Decision only intends to provide the Member States, the workers and the employers with information — not legally binding — on comparability of qualifications; it excludes formal and legally applicable recognition. This, however, does not mean that this effect will not be obtained through the comparative lists of vocational training qualifications and the tables of job descriptions and occupational requirements, which have in the meanwhile been drawn up by the European Commission and CEDEFOP with the help of experts from the Member States for some 100 occupations in accordance with Article 3 of the Decision. On the contrary, it is quite possible that this makes it easier for a worker to get his qualifications accepted — provided there are no other contradictory regulations in the Member States on authorization to exercise a profession — than through a legally binding provision such as the directive on higher-education diplomas. The information on each occupation and each occupational group and the mutually agreed practical job requirements create a Community-wide reference framework into which classifications from all Member States can be incorporated.

Despite differences in the definition of the occupations and in training structures, this method makes it possible to assign all certificates and training courses existing at national level to the described and mutually agreed characteristics of the occupation, provided they contain these characteristics. Implicitly this means that individual Member States who cannot give this guarantee at present can adapt their training courses correspondingly without having to harmonize the training routes which will continue to be different. It is still possible for individual training courses to cover several occupations simultaneously or be classified in this sense. This information system offers the possibility of approximating training contents step by step without, however, exerting direct pressure on the Member States to do so.

In some Member States there are a number of occupations with no formally recognized certificates; in this case the comparability will be confined to those countries which already have these recognized training certificates.

The 'general directive' approach means there is a foundation of mutual trust when the comparability procedures are being applied, because neither the training content and the examination requirements nor the training structures have to be scrutinized or subjected to an intensive analysis by the EC or other Member States. It is assumed that the Member States will only list certificates and training institutions which guarantee the proper preconditions for exercise of the occupation. Another reason why no problems arise is that every single employer in all the Member States can ascertain in the course of a probation period, established and covered by labour legislation, whether the worker concerned really comes up to his expectations.

In the present situation the worker very often does not get a chance of being recruited even for the probation period because the employer does not know about the comparable qualifications in other Member States and has no basis for comparison.

Whether and to what extent this procedure will have an impact on what actually happens, is a factor which cannot be definitively assessed yet. There are a number of positive cases which have already profited from CEDEFOP's preliminary studies. But, only after the first results have been globally implemented in the Member States, will it be possible to judge whether this approach has proved its value or not. However, numerous questions addressed to CEDEFOP show that there is much interest, especially on the part of multinational companies and individuals.

A number of disadvantages of this method still remain:

(a) Despite the Member States' fundamental willingness to cooperate — of which there is no reason to doubt — there is no evidence in practice whether the information has really been made accessible to interested or involved workers and employers.
(b) It is true that access to jobs will become easier, and it will also be possible to obtain the correct classification in the work organization concerned, but the increasingly important question of access to continuing and further training within the framework of career-promoting training facilities has not yet been clarified. This is particularly important because comparability does not automatically imply academic equivalence of training content and cer-

tificates or equivalent legal status. In this connection a more legally binding regulation would be desirable.
(c) The comparability procedure, i.e. the job descriptions and the comparative tables of vocational training certificates, have to be revised periodically in order to update the information and make it keep pace with developments in the occupations or the training systems. It is planned to update the tables every five years. This implies more time and effort than the 'general directive' method.

4. Possibility of extending the 'comparability' approach to other training levels

As already stated, the Decision of 16 July 1985 only covers the skilled worker/skilled employee level. An extension to cover other non-university vocational training qualifications at Levels 3 and 4 will require a Council Decision based, as usual, on a proposal submitted by the European Commission. The Decision could be drawn up along the lines of the 1985 Decision. The procedure at these levels would be less input-intensive than Level 2 if the work was limited to a specific number of leading occupational categories and if Levels 3 and 4 were taken together.

For instance, expert groups could be set up initially for the following employment sectors:

- technical/industrial sectors (electrical, metalworking, chemical, building, etc.);
- commercial, banking and insurance sectors and clerical and administrative occupations;
- social, educational and paramedical occupations;
- occupations in the arts and recreation sectors, e.g. handicrafts, tourism, music teachers, etc.

The measures enumerated in Article 3 of the Decision can also be applied for these training levels.

As the Decision leaves the nomination of experts to the Member States, their governments can decide whether they wish to involve the social partners to the same extent as in Level 2. If the political will exists, the legal basis to extend this work to Levels 3 and 4 could soon be created and it would be possible to complete the work for the occupational sectors mentioned above by 1992 (see *CEDEFOP guidelines* 1989-92, p. 11).

5. Approaches and possibilities for the development of occupational profiles at European level

Given the swift pace of technological, work organizational and economic change, some rigidly delineated mono-occupations run the risk of becoming obsolete if they do not succeed in incorporating new skills, abilities and know-how at an early stage. At the same time the basic characteristics of many individual occupations are becoming similar. At first this leads to new structures and training certificates in the organization of initial and continuing vocational training and to a new relationship between the two. However, developments in the practical exercise of the occupation are even more contradictory. Broad-based fundamental or key qualifications are considered to be a necessity, but if no additional technical specialization is given, they are often nothing more than a torso. The controversy between experts evolves around the question whether it is still the task of the education and training systems to retain such specialization courses as part of their vocational training qualifications, or whether this task should now be delegated to companies and public services and included in the further and continuing training courses linked to the work organization. This controversy has not yet been resolved. Depending on the sector or occupational group or Member State, both models still exist side by side and there are no indications which model will finally prevail.

The purpose of developing occupational profiles at EC level is to create a reference framework to which both models can relate. On the basis of past work and the results obtained from the work on comparability, and parallel to it, an attempt will be made to develop multidisciplinary and/or occupational group-specific job descriptions or profiles which will not only enumerate the occupational requirements, but also the main components of the necessary skills and know-how.

Such occupational profiles will be defined in all four non-university levels and will provide a means of promoting the training systems and training content of the Member States and their development, especially in those Member States which wish to build up or extend their systems. CEDEFOP carried out the first case-studies for this purpose in the field of information processing. Others will follow and be undertaken by CEDEFOP parallel to the work being done on comparability in the 'metalworking', 'chemical and process industry', and 'office and administration including banks and insurance companies' sectors.

III — Summary evaluation of past work in view of the 1992 perspectives and the implementation of Community-wide recognition of vocational training qualifications below university level

The three different approaches:

(a) 'general directive' or legally binding provisions for the so-called 'regulated occupations';

(b) 'comparability procedure', i.e. informing the responsible bodies and interested workers and companies or public services of the comparability of vocational training qualifications; and

(c) development of common definitions for European 'occupational profiles',

are not interchangeable and do not compete with one another; they are complementary!

They all serve to attain the goal of recognition of vocational training qualifications on the basis of mutual trust and more information, because mutual recognition not only requires the approximation of legal provisions but also mutual 'acquaintance', which is brought about by the 'comparability' and 'occupational profile' approaches.

However, a legal approximation of access restrictions through a directive also appears to be an additional necessity in order to remove all types of discrimination in access to further and continuing training and to certain training programmes and courses for specific supplementary qualifications (see Section II, paragraph 2 (a)), and discrimination related to nationality or the attendance at certain national (educational) institutions. This regulation could refer to the

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ADVOGADOS
(m/f)
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ESSENCIAL CONHECIMENTOS DA LÍNGUA INGLESA. PREFERÊNCIA DIREITO BANCÁRIO.
ÓPTIMAS CONDIÇÕES COM
DE DESLOCAÇÕES PARA O
SELECÇÃO RIGOROSA.
RESPOSTA COM «CURR
PARA O N.º233 A/90 DESTE
CONTABILISTA
ASSISTANT MANAGER - MUSIC
PERSCOMBINATIE
vraagt
free-lance medewerkers m/v
DEPUTY GAMES MANAGER
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Behutsame Stadterneuerung
Berlin
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Schwerpunkt Bauwesen
Etablissement bancaire luxembourgeois
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occupations and training courses defined through the comparability procedure and listed in comparative tables. This would also be a sound foundation for the elimination of eventual legal barriers and access restrictions.

As for the university level, in addition to the elimination of legal restrictions through the directive, it will probably need factual comparative tables on occupations and disciplines which will have to be defined jointly throughout the EC. In other words, what was done *a priori* for the non-university occupations will now have to be done *a posteriori* for the university level. Without effective and mutually agreed bases for comparison, the general directive will be a mere torso. The necessity of extending it will soon become evident when it is being implemented, irrespective of the differentiation options it contains such as aptitude tests or a mandatory period of job experience. Practical problems will probably arise in the implementation of the directive if there is a lack of Community-wide, mutually agreed comparability or comparative tables on disciplines and professional specialization.

Therefore, comparative studies should be commenced before the end of the two-year period for the application of the directive as national law, in order to get mutual agreement on the disciplines and occupational sectors at university level. This is a very labour-intensive undertaking but it appears to be indispensable if there is to be effective recognition of vocational training qualifications in the daily life of the Member States and if there is to be effective development of a Community-wide labour market and initial and continuing training market.

These approaches, which are aimed at removing the formal and informal obstacles to the free movement of workers, will have to be supplemented by the progressive establishment of a European register of recognized occupational profiles (see *CEDEFOP guidelines*, Chapter A (b)) to which a list of recognized training institutions could also be gradually added. This recognition does not mean that it is granted or sanctioned by the EC. This should definitely remain within the competence of regional authorities or the national governments with the appropriate participation of the relevant social agents, because only at this level is it possible to update and continuously adapt the content of training and examinations to rapidly changing requirements.

The studies undertaken within the context of the three method approaches at EC level have the task of setting the absolutely imperative framework conditions within which the other levels of political intervention — local, regional, national — will retain the highest degree of autonomy. The principle of subsidiarity and partnership between the levels is particularly relevant in the case of education and training and labour market issues. However, certain framework conditions are a prerequisite for effective and mutual coordination between the different levels.

IV — Recommendations

1. The European Commission should — on the basis of a study of legal discrimination in access to certain non-university occupations and further and continuing training facilities — prepare a directive for the elimination of legal obstacles along the lines of the directive on higher-education diplomas.

2. The European Commission should — together with the Erasmus bureau — make a proposal requesting the Internal Market Committee of the Council to appoint an expert group consisting of experts from all the Member States, in order to draw up comparative tables of existing occupational sectors and disciplines at university level; this would facilitate the implementation of the directive (see Section II, paragraph 1).

3. The work on the comparability of vocational training qualifications should be disseminated to the relevant bodies and organizations and employees in the form of publications and should continue as planned. The Commission should with priority see whether this work can be extended to cover the other levels (3 and 4), independent of, but complementary to the 'general directive' recommended in Section II, paragraph 1. With close cooperation between CEDEFOP and the Commission it should be possible to complete this work for the leading occupational categories by 1993.

4. The efforts to develop 'European occupational profiles' linked to approach (c) in Section III could, in addition to progress in legal and factual recognition, make a useful contribution towards improving the transparency of training and employment systems and above all, towards developing these systems with the aim of their gradual approximation (see Council Regulation on the establishment of CEDEFOP 1975).

5. All three steps will enable CEDEFOP and the Commission to develop concrete proposals for the introduction of a European Vocational Training Pass (see Adonnino report of 1985 on a people's Europe).

All this calls for united and purposeful action, i.e. a joint effort is required if we are to approach the goal of free movement of persons and services by 1993.

Mastering metals — Problems in analysing and classifying 'new' technical jobs in metalworking

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The work on comparability of vocational training qualifications at CEDEFOP is supported by national studies on the state of and developments in occupational structures. These studies have first been undertaken for the metal industry. A provisional comparative analysis of the national reports has considerably helped the work of the national experts in deciding on common occupational definitions for skilled metalworking occupations, the so-called Level 2 occupations in the EC classification scheme (see Annex). At the same time, however, this analysis has brought to the fore the problems that do exist with classifying occupations in terms of this scheme due to ongoing technological and work-organizational changes that are taking place in the sector. These may also increase difficulties in terms of comparability due to different training routes that exist in the Member States for similar occupations. Such comparability problems become even more apparent when dealing with occupations at Levels 3 and 4. The very principles on which traditional hierarchical distinctions between occupational levels are based, and which have also been applied for the EEC scheme, increasingly lose their validity.

At the same time however, the question of comparability of occupational titles becomes ever more relevant in view of the freer movement of workers aimed at after the further integration of the EEC in 1993. For this reason CEDEFOP, parallel to its work in the execution of the 1985 Decision of the Council of Ministers on the comparability of vocational training qualifications for Level 2 occupations, is also seeking to establish a methodology and analysis of occupational qualifications, which will overcome some of the shortcomings in the existing five-level EC vocational qualification scheme and prepare an outline European directory of occupational profiles. The first aim of this new approach was a 'pilot' analysis of the interrelationship between functions, tasks, competences and corresponding qualifications in the main metalworking occupations. Our approach was directed at resolving two principal problems in the present scheme's range and methods:

- national variations in the methods of training, and task and skill contents of comparable occupational categories;
- technological and organizational changes in the last decade which have undermined some of the assumptions that underlie the existing scheme of differentiated vocational levels.

This article reflects the present stage of our work which has by no means resulted yet in a fully elaborated conception for a European directory of occupational profiles. We therefore would welcome comments from our readers which could help us in our further considerations.

Section 2, the first part of this article, focuses on the logic of the five-level EC classification scheme and, in particular, on the criteria used to determine the character of jobs at Level 3. The next section outlines the components of a fresh approach to vocational qualification structures based on a multi-dimensional view of task skills and responsibilities. The following Section 4 illustrates this methodology in relation to the metalworking sectors which have been studied in the current CEDEFOP comparability project.

Finally, in Section 5, we outline the existing ambiguities in applying Level 2 and Level 3 categories to metalworking jobs. This analysis includes a discussion of the additional blurring of the skill boundaries between these levels arising from the computerization of design, planning and machining. It concludes with a comparison of the application of the EC's five-level qualification hierarchy and a tentative multi-dimensional framework to selected 'technician' jobs. However, we begin our analysis, in Section 2, with an examination of what is meant to constitute a Level 3 job, and the ambiguities in this definition.

The concept of occupational levels and the content of Level 3

The EC's vocational structure defines Level 3 jobs, as with the other levels, in terms of an assumed relationship between:

- **vocational training:** its level, depth and duration;
- **skills:** the complexity and abstraction of these that are needed for the relevant tasks;

■ **responsibility:** the degree of autonomy and discretion allowed, or required, for the execution of a particular set of tasks.

In some respects the relationship between these three factors is unambiguous. Engineering design work requires considerable technical education in science-based studies, in applied mathematics and engineering theory. Possession of this knowledge is the indispensable basis for actual design practices, calculations of load, tolerances, pressures, etc. These combinations of practical skills and theoretical knowledge, in turn, make it possible for managers and chief engineers to allow such workers to perform the relevant tasks autonomously.

Yet, in other ways, there is no straightforward correspondence between training, skills and responsibility. The same task, say detail design work, can be undertaken as part of the work role of technicians with academic engineering training, or promoted ex-apprentices with enhanced workplace training. In the former case it may be an element of a broad autonomous work role, or it may be made into a specialized task for repetitive execution. It may be left to the discretion of the trained professional, or closely prescribed and supervised by the latter leaving little scope for discretion. It may, finally, have its skill requirements further narrowed by computerized draughting systems.

Bearing these complications in mind, consider the definition of Level 3 occupations:

'Training providing access to this level: compulsory education and/or vocational training and additional technical training or technical educational training or other secondary-level training.

This form of training involves a greater fund of theoretical knowledge than Level 2. Activity involves chiefly technical work which can be performed independently and/or entail executive and coordination duties'.

CEDEFOP [1987] p. 8.

This definition acknowledges that there is a variety of possible training routes and thus identifies the defining characteristics of Level 3 as:

■ theoretical knowledge,

■ independent performance of technical work,

■ the possibility of managing the work of others ('executive or coordination duties').

Theoretical knowledge is defined only in relation to Level 2 jobs and the performance of the technical work is also implicitly compared with the former level. In Level 3 technical work is unreservedly independent rather than 'within the limits of the relevant techniques' (Level 2 description).

How easily can this formula be applied to jobs in metalworking? In some cases it is straightforward, but in others it gives ambiguous results. As discussed in the example above, drafting occupations sometimes clearly involve independent task execution and a degree of theoretical knowledge that is greater than that of, say, the operator of a machine tool. But it is not possible to say, unreservedly, that all those in draughtsmen occupations have as much practical knowledge for, and independence in, the choice of techniques in their tasks as, to take another example, a qualified machine tool setter ('insteller', 'opstiller', 'Einrichter', 'ajustador', 'regleur', 'attrezzatore'). (This point is illustrated further in Figure 1, p. 16.)

The latter bases his/her judgements on a body of theoretical and practical expertise, some of which may even have been gained by the same kind of training as the draughtsman. The setter-operator may also have to coordinate some of the work of machine operators, while the draughtsman will probably have no such responsibilities, and may have his/her own work closely prescribed. Yet on the current classification a machine tool setter would most likely be considered to be a Level 2 occupation.

Occupations directly involving work with computer technologies show up even more complications in the demarcation of Level 2 from Level 3. On the one hand the automation of draughting tasks has led to a greater simplification of some, but by no means all, draughting and design jobs. On the other hand some CNC machining now requires more planning tasks, and therefore associated discretion and theoretical knowledge, from those operators who complete the 'part-programs' at the machine tool.

Even more striking are some of the new posts for monitoring, adjusting and controlling flexible manufacturing cells and flexible manufacturing systems. Those in charge of the day-to-day running of these installations are invariably ex-setters and machinists. They may be required to have:

■ knowledge of different systems — software, mechanical and even electronic,

■ the decision-making capacity to intervene without instructions from more senior engineers and managers.

Possible examples of the latter may be the 'Straßenführer' in German FMSs (d'Allessio and Wittke, 1988), and perhaps the transfer-line 'conduttore' in Italian car plants.

All of these examples, both with conventional and microprocessor-based technology suggest the need for a recasting, or at least a fuller explication of the existing scheme of occupational and qualification levels. The next section outlines the basic features of a multi-dimensional classification model as this might apply to Level 2 and Level 3 occupations in metalworking. These arrangements are not necessarily a replacement classification system but they could form the basis of a complementary, and more fluid, directory of occupational profiles.

Multi-dimensional occupational profiles

One of the main complications of the current EC vocational qualifications scheme is its understandable need to define jobs in relation to the level and extent of vocational training. However, as the previous section explained, there are a number of training and educational routes into the overlapping work roles that cluster around the planning, draughting and setting up of metalworking processes.

Our first comparative report also emphasized the variety of different vocational routes into the same categories of occupation as between one EC country and another. Differences between 'apprenticeship'-based and college-based schemes meant that:

■ some emphasize theoretical instruction,

■ others emphasize practical learning.

That report also observed that workers' training could lead to certified competence at one level and yet these workers could be employed in jobs which were

Manfred VOLLMER

either above, or below, their formal qualifications (Jones and Scott, 1989, p. 31 *et seq).*

Other occupational classification schemes, such as the British Standard Occupational Classification, include vocational training and education in their occupational orders. Others, however, such as the ILO's ISCO scheme, give priority to skills to the exclusion of vocational training aspects (Hoffmann and Scott, 1989, p. 4).

The ISCO analysis however draws attention to two issues which are important to the question of occupational comparability in metalworking:

- the ambiguity of the term 'skills',
- the dispersion of specific jobs and skills across a range of different industrial sectors (Hoffmann and Scott, p. 5).

Skills are a problem because of their multi-dimensionality.

- Even low-grade jobs may depend upon quite developed, but socially unrecognized inter-personal, intellectual and sensori-motor skills (see Kusterer, 1978; Jones and Wood, 1984; Libetta, 1988).
- Some skills are intellectual and conceptual in character, e.g. in design, planning and administration.
- But they may also be infused with, and sometimes inseparable from technical skills, e.g. the ability to handle measuring, calculating and drawing instruments.

More fundamental is the problem of ranking skills, which is endemic in occupational classification methodologies. Can we say that the conceptual skills of, say, a clerical administrator rank higher then the technical skills of a machine tool setter? Let us return to these problems in a moment and deal first with the other problem of occupational location.

The Sedoc and ISCO 68 schemes grouped occupations according to their location in industrial sectors. The problem here is of overlap between sectors and, more importantly, the trans-sectoral nature of some occupations (Grootings, 1989).

- For example, several key jobs in metalworking, such as draughtsman or machine tool setter-operator, can also be found in other sectors.
- Indeed, it has been argued that metal-machining constitutes a universal 'labour process', like accounting, or design, which can be found in diverse industrial and service sectors (Kelley, 1984).

An alternative methodology for identifying and relating occupational groups is that suggested by ISFOL and the Government of Quebec (Grootings, 1989) and also outlined by CEREQ. In a similar manner to Kelley's 'labour processes', these approaches isolate functional areas of work such as:

- 'metal production', 'mechanical maintenance', or, more pertinently,
- metal production, primary transformation of metal, metal-machining, assembly and finishing ('finitions') (CEREQ, p. 13).

These kinds of scheme then tend to proceed from the functional, or subfunctional, activity areas to occupations or occupational families, such as machine tool operators; but this next step may be premature:

- the occupational differentiations made may be too general to relate to the qualifications aspects;
- it may entail all the problems of implicit, but over-simplified, skill ranking and specification.

We have suggested (Grootings, 1989) that to descend to a level of analysis which identifies specific task 'bundles' would be too demanding. Instead we propose that the level of analysis should:

- be between that of occupations and discrete task activites;

■ consist of groupings or 'modules' of task activites;

■ these modules should be capable of translation into types of competences such as theoretical and practical knowledge, social and attitudinal requirements.

Using this proposal as a starting point we can sketch out an initial framework that relates occupational divisions, responsibilities and skill types (the current EC framework) to the newer suggestions of industrial functions, task modules and occupational competences.

A skill-based model of occupational types

Industrial processes

The central metalworking processes in the industries with which we are concerned are the machining of metals, the related metal-forming processes, and the fitting and assembly of the resulting components. However, if these two processes are treated as the essence of the metalworking trades there is a danger of overlooking or marginalizing functions which are of central or growing importance in these sectors.

■ The increasing importance of detailed design, coordination and planning, let us say, information processing functions.

■ Adjacent to the metalworking process proper are electronic maintenance and assembly.

Information processing has its own proper sectoral domains, in education, office administration, accounting, etc. Electronics is a field whose specific activities make up the electronic engineering, computers and related sectors. However, both these fields of expertise are becoming increasingly integral to the making of metal-mechanical products.

Paper-based communications of information on sales, stocks, and work-in-progress meant more clerical and quasi-technical jobs in metalworking in the earlier part of this century but now:

■ the automation of these processes by computer technologies is checking and even diminishing the numbers in these jobs, and eliminating routine clerical positions;

■ these developments are being combined with the spread of information-dependent 'just-in-time' production systems;

■ the net effect is to increase the need for information-processing skills, such as basic statistical techniques, in technical, supervisory and even some shopfloor occupations.

The chief impact of electronics is in the control mechanisms of metalworking machine tools and in many of the final products assembled. The main effects, so far, for the field of occupational responsibilities are as follows:

■ the 'downward' extension from the planning and process definition functions (see 'Task groupings', p. 15) to include machine controls over operating and setting activities in the parts-production functions;

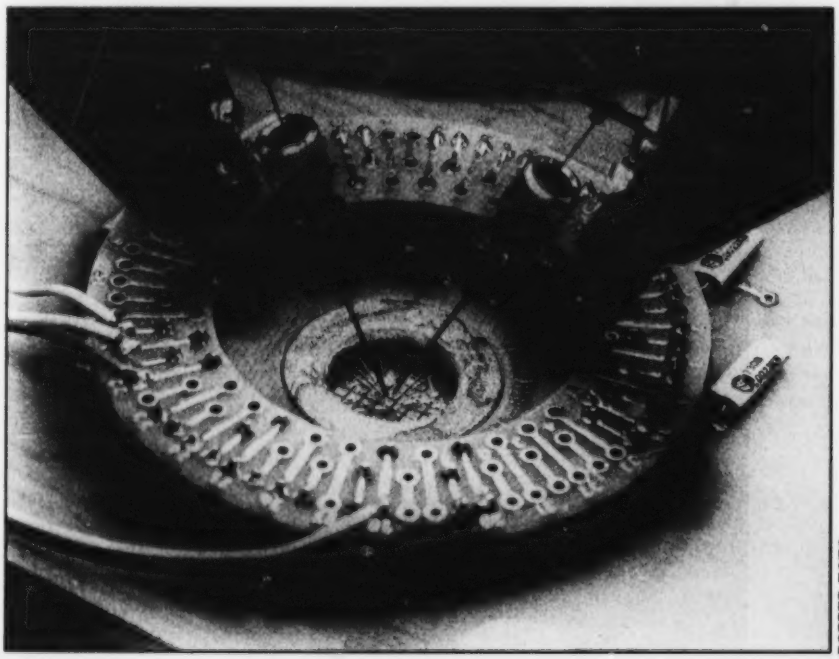
■ the 'upward' movement of operating and setting responsibilities to include information-processing tasks associated with machine programs;

■ microprocessors and computerized controls require electronic skills in maintenance tasks;

■ maintenance work is beginning to be incorporated into operators' jobs as employers seek greater task flexibility from existing occupations;

■ as microprocessors and electronic controls replace mechanical devices in machinery products the nature of fitting and assembly jobs is modified, especially amongst those responsible for testing, and an appreciation of electronic/mechanical interfaces is required of planners and designers.

Thus metal-machining/forming and component assembly are the dominant functions in metalworking enterprises. However, consideration of electronics and information processing establishes that particular occupations in these sectors may also include tasks and skills needed for such ancillary products and processes.



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Occupational 'families'

Occupational classifications conventionally group jobs together into clusters on the basis of shared tasks, functions and skills. The problem with existing approaches is that they normally do so, as with the EC's five-level scheme, within a hierarchical framework. The result is that occupational families are grouped only on a horizontal basis, e.g. all machine tool operating, or setting/operating posts. As was argued in the previous section this often arbitrarily privileged one occupational trait or skill type over others. It may also now be a

conceptual barrier to the recharacterization of the new hybrid occupations that technological and organizational changes are promoting across the Level 2/Level 3 border.

These considerations therefore suggest that a new analysis should not take occupational families as given but should only make such groupings after a prior analysis of tasks and competences.

Task groupings

This step in the analysis is, perhaps, the most difficult to accomplish. It raises fundamental problems.

■ What selection criteria can be applied to group the often diverse range of tasks that make up specific occupations?

■ How can this be done in a way which allows comparability between different occupational groups, and at the same time permits the establishment of the distinctiveness of borderline occupations?

A review of existing metalworking occupational descriptions suggests that the many different task distinctions first need grouping into the following activity functions:

(a) definition of parts, products and processes,

(b) production support and preparation,

(c) parts production,

(d) fitting and assembly,

(e) control, coordination, monitoring and maintenance.[1]

Each of these is distinguished by a mix of tasks and task skills which are unevenly distributed amongst the occupations that undertake the stock of task requirements. However, the dominant occupational characteristic will vary, so that:

■ in one task area, such as definition of products and processes, conceptive tasks and skills will be central to most jobs, while

■ in another area, e.g. parts production, technical-practical tasks will predominate.

Section 5 provides an illustrative grouping of the 'task modules' within the appropriate activity functions closest to EC Level 3 occupations. As an example of the relationship between task modules and functional activity areas see the suggested contents for 'Definition of parts, products and processes' in Table 1.

Table 1

Task groups for functional area: Definition of parts, products and processes

translation of design specifications into general drawings

assessment of design for construction feasibility

calculation of dimensions, weights, tolerances, bores, threads

selection of materials, methods, parts to be used

estimation of costs of materials, methods and parts

detailed drawing of the dimensions of components and their reference points, dimensions and tolerances

planning availability, procurement, and sequencing of materials, parts, tools, human resources and operating and inspection techniques for overall production processes

Skill structures

Volker Wittke has pointed out the uneven combinations of theoretical or abstract knowledge and 'Technik' required in many metalworking jobs. These two forms of knowledge are the basis for correspondingly different kinds of skills. However, on the assumption that 'Technik' corresponds to 'practical know-how' in English, it seems difficult to describe jobs as being characterized solely in terms of just one of these skill dimensions. Logically therefore:

■ some occupations will have the bulk of their task skills rooted in 'Technik' and others in abstract forms of knowledge;

■ but in each case there is more likely to be a difference of degree in their composition rather than the complete exclusion of the other type;

■ it ought then to be possible to map occupations according to the extent to which the different types of skill prevail in each occupation;

■ Figure 1, overleaf, illustrates this possibility for some representative metalworking occupations.

In the UK, the Standard Occupational Classification is based upon the notion that the level of skill or competence results from the greater complexity rather than predictability of jobs, and discretion rather than supervision.

Complexity can be interpreted within the two-dimensional skill model (see Figure 1) to mean that complexity increases in a job the closer theory-based skills and 'Technik' type skills approach equality. Conversely, the more homogeneous that a job is in terms of theory or 'Technik' the less complex and therefore less skilled it is. The example of a surgeon comes to mind, as a professional occupation in which tasks based on theory and 'Technik' are equally important. Such reasoning is also consistent with the idea of polyvalence as a paragon of skill.

Applying this logic would break with the ranking in the EC's five-level hierarchy. Instead there would be something like an inverted U-shaped curve: the jobs in the middle bands of the current EC hierarchy (see Figure 2), would be the most 'skilled' (in terms of a mix of theory/'Technik').

However the 'mapping' of skill structures on to particular occupations would also have to take account of the task organization within which different skills are exercised.

■ The extent to which job tasks are either discretionary or supervised;

■ correlatively, the degree of self-planning of tasks that is allowed.

A priori we would assume that the more unpredictable that job tasks are, and therefore the higher the mix of theory and 'Technik', then the more likely it is that the job will involve high levels of

[1] These categories supersede our earlier attempt to categorize metalworking functions into production support, component manufacturing and fitting and assembly (Jones and Scott, 1989, p. 8). Also they do not necessarily correspond to the departmental divisions of larger firms. Indeed in smaller firms they may not even be separated out into different occupations!

Figure 1
Two-dimensional skill model (of selected UK occupations)

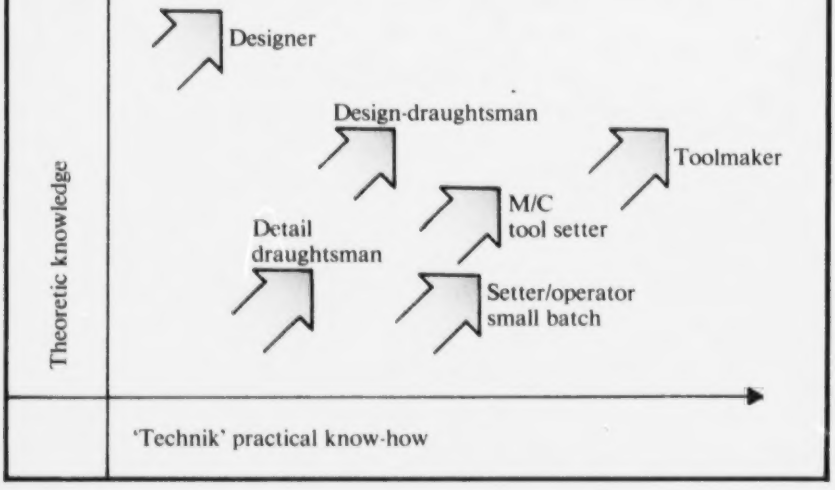
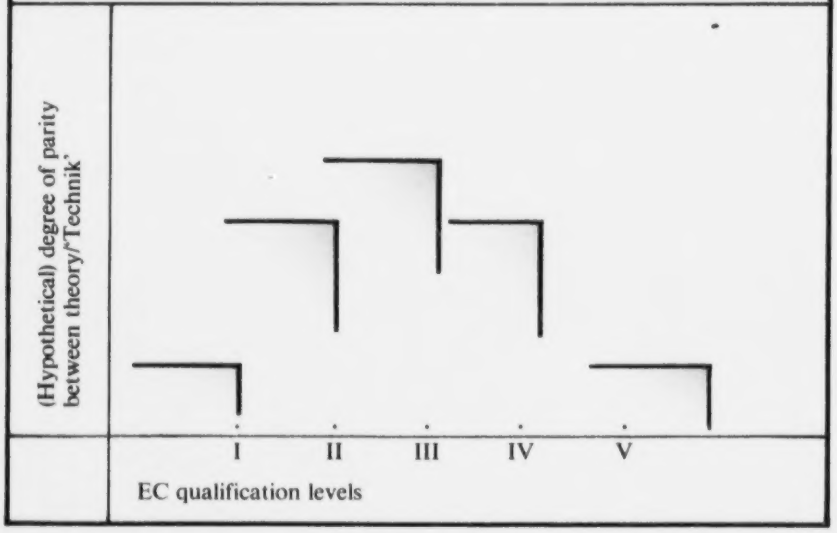


Figure 2
Task/skill complexity as a mixture of theory and 'Technik'



discretion and low levels of supervision. However, this may not necessarily be the case. It may depend on other social and material factors:

- management/organizational style,
- industrial relations considerations,
- the cost and dangerousness of machines, products and processes, etc.

Summary

As is often done in this kind of analysis we have not attempted to deal with the coordination and supervisory skills and tasks of categories such as the 'Industriemeister'. It may be that these roles are not compatible with the framework just developed. This is an important problem because under the EC scheme the 'Industriemeister' is clearly a Level 3 job. Yet the qualifications of similar supervisory roles in other countries, of British workshop 'foreman' for example, would not seem to be comparable. The broader question is whether the two-dimensional model is adequate to deal with managerial skills (coordination, planning and supervision) or whether these constitute an additional dimension.

The new development of 'self-managing' work groups extends the relevance of such skills beyond specialist supervision roles into a much needed conceptualization of the qualities for collective and cooperative working. If, for example, more work with automated systems involves autonomous work groups, then coordinatory and co-management skills will be important; and these skills may be different again from planning/coordinating one's own work, or planning/coordinating the work of one's subordinates.

However, we now have the elements for a multi-dimensional approach to metalworking occupations at Level 3:

- a functional area,
- task groupings or modules,
- skill dimensions and task organization.

This framework can now be compared with the existing EC criteria — of vocational training levels, skills, and responsibility — by analysing occupations approximating to Level 3 in the latter model, which are also affected by techno-organizational change.

Technological change and new perspectives on 'Level 3' jobs

In the report on the vocational structure of metalworking in the UK it was argued that EC Level 3 translated most easily into the British category of 'technicians'. As in the Federal Republic of Germany (with the 'Techniker' and 'technische Sonderkräfte') there are two grades of technician: the technician engineer and the engineering technician. They are distinguished by the breadth of their task area and the length and level of their vocational training. Whereas technician engineers will do design draughting, engineering technicians will occupy detail draughting jobs.

This final section focuses on the lower grade; i.e. engineering technician in draughting and planning, for the following reasons.

■ The skill density of work for technician engineers tends to *increase;* if only along the vertical axis of Figure 2 as tasks are computerized.

■ This phenomenon is well documented for the introduction of computer-aided design (CAD) systems in which the routine calculational and manual drawing tasks of design and draughting jobs tend to be eliminated (Baldry, 1986; Libetta, 1988; McLoughlin, 1989).

■ It is likely that related forms of automation of information processing have similar effects on similar technical jobs at this level.

These technician jobs need to be considered in relation to occupations that the existing EC classification would probably rank as skilled Level 2 jobs; but which many believe are developing Level 3 characteristics. On the other hand, 'shopfloor' metal machining and metal forming jobs provide a convenient comparison and contrast because:

■ there are sufficient research studies on the computerization of metal machining to provide illustrative evidence on these jobs;

■ some of their tasks overlap between technician and machinist work roles;

■ trade union and some employer policies are seeking to regrade CNC machining jobs to technician (i.e. Level 3) status.

The computer-aided draughtsman

Draughting is the most common technician-type job in Britain. The job description of the British engineering technician using conventional draughting methods includes the following tasks and duties:

(a) To examine overall drawings and other data provided by design draughtsmen *(sic)* to ascertain requirements;

(b) To prepare detailed drawings, to scale, of individual components, parts or sections of mechanical engineering items (hand and machine tools, plant, machinery, engines, aircraft and vehicle structures);

(c) To insert on drawings production guidance and information such as datum points and centre holes, dimensions and tolerances, materials to be used, type of surface finish required, heat treatment required and location of lubrication points;

(d) To arrange for completed drawings to be reproduced for use as working drawings by production departments;

(e) To prepare part lists as required.

He may also:

(f) Calculate dimensions, weights, etc.;

(g) Produce detailed drawings from rough sketches or from existing items. (Adapted from Department of Employment (UK) 1972, p. 236.)

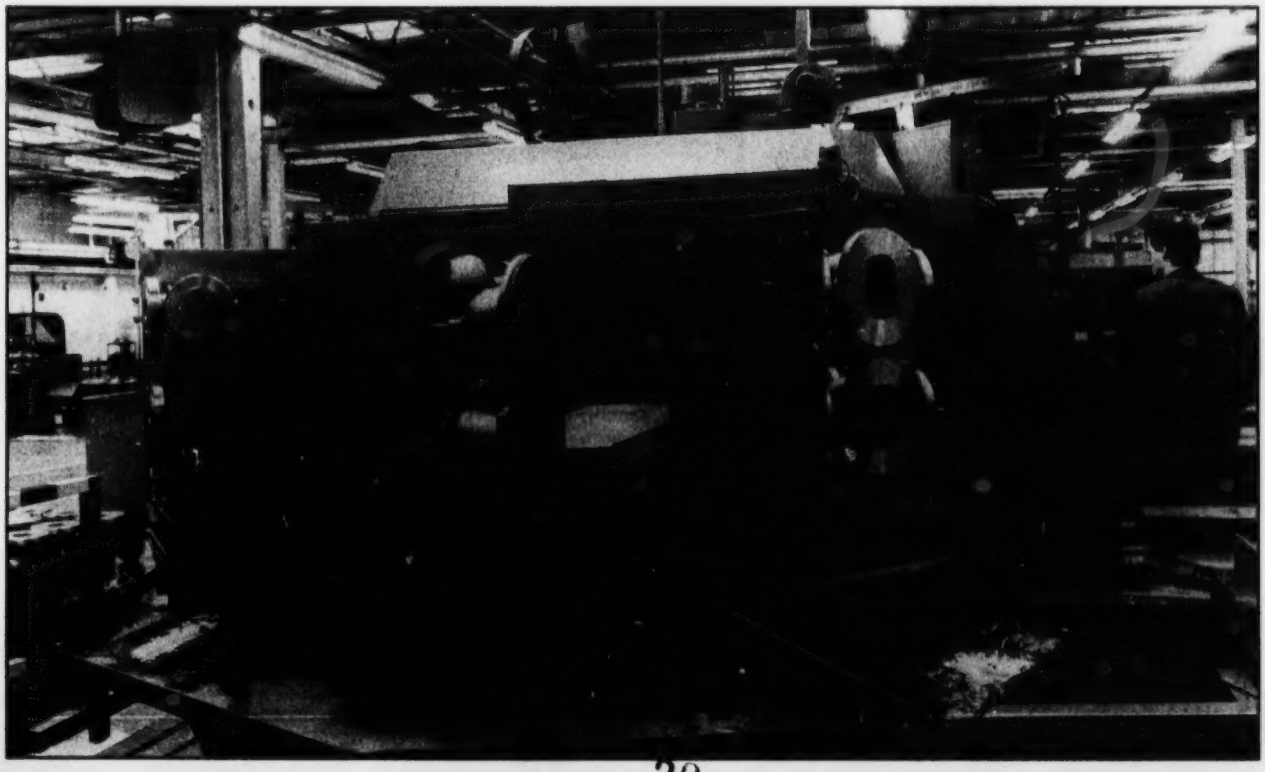
There is as yet no comparable, officially recognized UK job description of detail draughting work with CAD. However, there is information from mechanical and electrical engineering firms on the task effects of CAD. These can be summarized as follows:

■ drawing, labelling and dimensioning are produced in standard formats by the CAD systems;

■ CAD provides 'libraries' of standard parts and components, which can be called up and automatically inserted in 'new' drawings in different ways;

■ most of the work of CAD draughtsmen consists of enlarging and incorporating new details in predetermined designs.

(Baldry, 1986, p. 64.)



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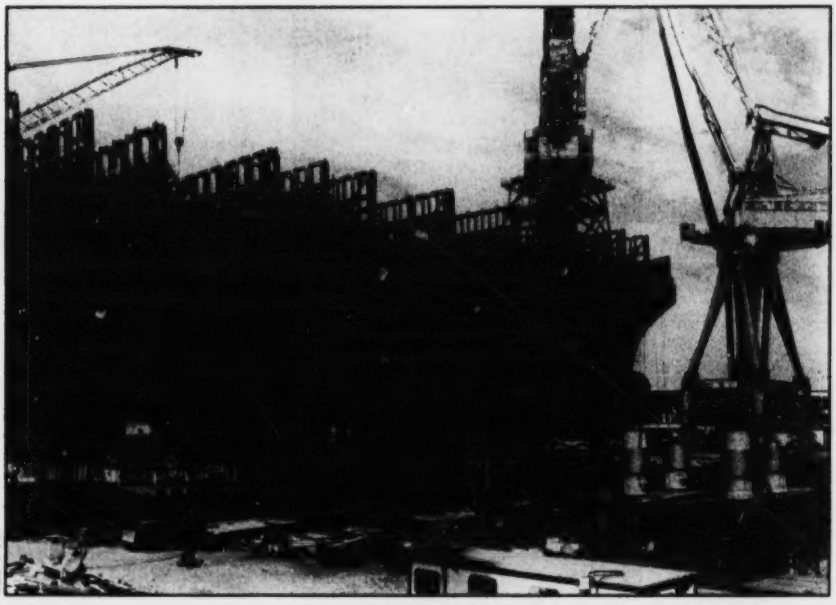
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These developments affect the task elements, described above, of the conventional detail draughtsman in the following ways:

(a) Assessing required content of drawing — probably unchanged.
(b) Detailed scale drawings of parts and components — supplied by CAD system.
(c) Inserting details of production requirements — partly supplied by CAD system.
(d) Reproducing as working drawings — probably supplied by CAD system.
(e) Calculating weights, dimensions, etc. — can be automatically requested from CAD system.
(f) Detailed drawings from sketches, items — partly unchanged/partly supplied from CAD system.

Assessing the CAD draughtsman's work in relation to the EC scheme's criteria gives the following inferences:

■ The fund of *theoretical knowledge* is diminished (changes in (b), (c), (d) and (e) above; but conceptualizing or 'envisaging' tasks (a) and (f) remain).

■ *Complexity and abstraction* are reduced.

■ *Autonomy and discretion* are reduced by dependence on the CAD system's supply of standard configurations and dimensions.

Other work organizational changes arising from the introduction of CAD may reinforce the last tendency, namely:

■ CAD draughtsmen's inputs can be timed to increase productivity and efficient use of the systems.

■ A 'Fordist' division of labour can be imposed, with different draughtsmen working on various parts of the same drawing simultaneously, as with serial production on assembly lines.

Thus there is the *potential* for detail draughtsmen's work roles to be standardized to a Level 2 degree of proficiency; i.e. 'independent within the limits of the relevant techniques' (CEDEFOP 1987, p. 8). However, there does not seem to be a way of deciding whether these draughtsmen's jobs remain within, or below the Level 3 category on these criteria. For the importance of the theoretic and technical skills still required can only be assessed in relation to those of the levels above and below them, yet these are also in the process of change.

However, if we apply the multi-dimensional framework outlined in pp. 12 - 14 above, the outcomes are more complex. The primary industrial process of CAD draughtsmen can be regarded as a specific form of information processing, rather than the production of an intermediate product: the detailed drawing. They are of course still concerned with the metalworking function of the 'definition of parts, products and processes' (p. 15, 'Task groupings'). The range of skills can be regarded as only slightly changed, in terms of the distribution illustrated by Figure 2, and the possibility has been created for greater application of conceptive skills.

■ The proportion of the draughtsman's task repertoire that requires practical technical execution — calculations, drawing to scale, etc. — has been made routine by the CAD systems; consequently the more theoretically based tasks, such as 'envisaging' and conceptualizing basic designs are *relatively* greater.

■ Operating the CAD work station, memorizing keyboard functions; software routines, accessing rules are *new* practical-technical skills whose apparent triviality and 'routineness' should not detract from their necessity and the necessity of learning them.

The way that these new skill distributions are organized in specific work roles will depend, of course, on several managerial, organizational and industrial relations factors. For example, a 'Fordist' arrangement would mean standardizing products and therefore designs and recruiting and specializing draughtsmen into the routine practical-technical tasks. Alternatively, as some studies have already found, (e.g. Libetta, 1988) more use could be made of draughtsmen's tacit and conceptive skills to improve the scope and sophistication of a greater number of designs on a commercial strategy of 'flexible specialization' (Piore and Sabel, 1984). For classificatory purposes it might then be desirable to distinguish between 'detail draughtsmen of standardized products' and 'detail draughtsmen of diverse products'.

The CNC part-programmer

The British Codot classification has a general category of numerical-control planner, with the following description of tasks and duties:

To plan in detail, and to express in form suitable for numerical control, all steps necessary for the operation of machine tools to achieve specific results, i.e.

(a) examining working drawings, specifications or other design information and determining the sequence of operations involved in machining the designated component;

(b) analysing tooling requirements and preparing a tooling plan embracing specifications for standard and new types of tools and the sequence in which they are to be used, together with speeds, feeds, depth of cut and other tooling data;

(c) preparing instructions for basic positioning of workpiece on machine and methods of securing;

(d) calculating coordinates in relation to zero point of machine for positioning and repositioning of workpiece in relation to tool for each machining operation to be performed;

(e) collating all data and preparing program sheets detailing sequences of operations, coordinates, tool changes, speeds, feeds and other information, and arranging for some or all of these data, depending on the sophistication of the NC system, to be encoded on tape in a form suitable for the NC unit.

He may also:

(f) set up and run a preliminary program to determine practicability before finalization;

(g) organize and control the work of other NC planners.

These generic duties changed over the past 10 years with the advent and spread of CNC machine tools. The latter contain more sophisticated software affecting several of the above tasks, especially:

(a) standard tooling and cutting data,

(b) sub-routines and direct entry into the memory of the mini or microcomputer using more 'conversational' languages or simplified codes.

Equally important has been the relocation of the computer controls to small cabinets, or microcomputers attached to the machine tool itself, rather than in central computers in office locations. These make it more convenient to perform at least some of the programming tasks at the machine where the operator or setter-operator has general responsibility.

The net effect of these technological changes on programmers' skills has been similar to that of CAD draughtsmen:

- standardizing and automating many routine calculating tasks;

- leaving envisaging tasks and related tacit skills — the more conceptual qualities in this context — intact.

However, the skill mix is shifted towards a greater preponderance of conceptual elements than was the case with the CAD draughtsmen because many refinements and corrections to speeds, feeds, depths of cut, and sometimes coordinates can be made by the skilled (Level 2) machinist, tool-setter, or setter-operator. This

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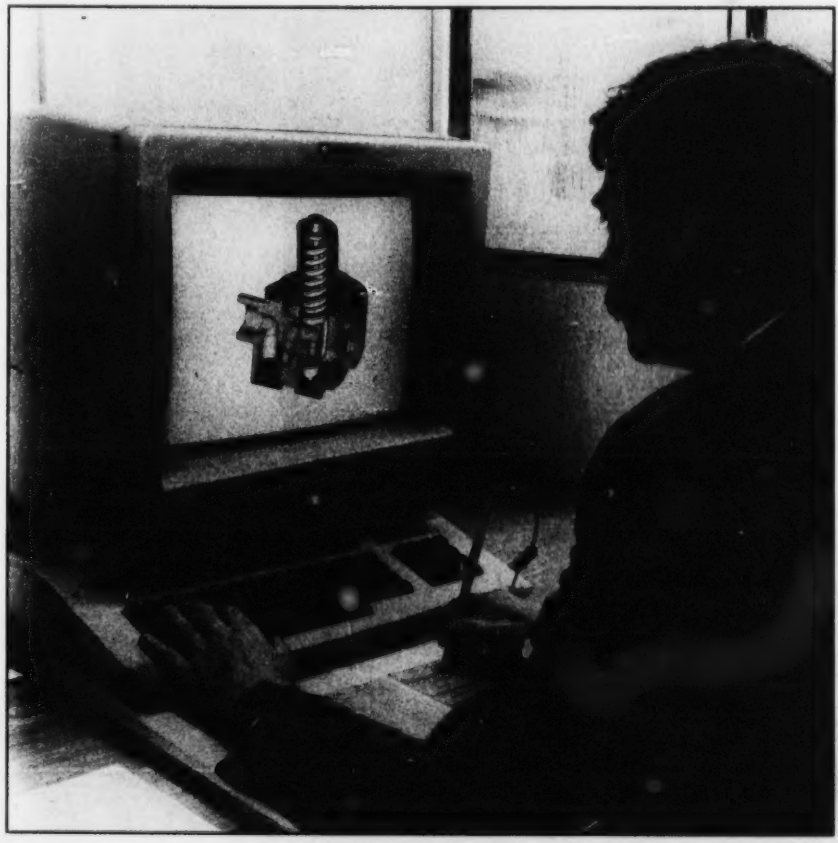

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redistribution is feasible where batches are small and varied, and because the Level 2 worker can respond more quickly and has more local knowledge of machining problems and peculiarities.

Under these circumstances the role of programmers can be expanded, 'horizontally', to deal with a wider range of programs, or 'upwards' to include part of the draughtsman's tasks (a possibility, of course, with CAD/CAM). However, unless this happens, in those cases where management and unions agree on 'shopfloor' programming and editing, the skill range of the part-programmer will be compressed and that of operators and setters of machine tools increased.

Machinists as technicians?

We are then faced with a different problem. Within the five-level scheme it is clear that the original task range of NC planners/part-programmers was so great that even after a contraction of their tasks, as a result of CNC, it remains a Level 3 or, in English, a 'technician' occupation.

But machinists, setters, or setter-operators of CNC may retain their conventional machining know-how and also add:

- some programming or program editing skills,
- understanding of specific computer-control processes.

So the 'downwards' transfer of the tasks of programmers also increases their task range (Francis and Grootings, 1989). Has it been increased enough to qualify these workers as Level 3?

In small workshops this will probably occur in many cases, as they adopt a wide range of such CNC tasks because there are insufficient workers to divide up the tasks into technical and machining work roles.

Even in larger establishments there is evidence that managements are prepared, for diverse reasons, to link machinists into the technician staff. One such British case involved grades of 'technicians' on CNC work even though their responsibilities were for quality inspection, tooling, and program checking rather than any determination of the main features of the initial part-programs (Wilkins, University of Bath *mimeo*, 1988).

Conclusion

The existing EC five-level scheme amounts to a hierarchical ordering of skills. The newer types of occupation cannot be placed within this classification without both further evaluation of the significance of different kinds of skills and of the effects of technological change on adjacent work roles. Because of the different ways in which the new potential skill configurations can be used in practice, any general placing at, say, Level 3 entails arbitrary decisions. It seems probable that many traditional occupations are also difficult to allocate unambiguously to one of the five levels. Moreover, a different analysis of skills and competences, as indicated on pp. 14 - 16 above, would lead to a quite different ranking outcome.

It has also been pointed out elsewhere that the five-level scheme depends upon assumptions that a Tayloristic system of occupational specialization prevails, whereas, in reality, this may only be true for certain larger firms in northern Europe and may also be changing as even these kinds of firms experiment with less rigid occupational divisions (Jones and Scott, 1989).

The application of the dimensional approach has, however, been able to identify a broader range of task skills in occupations such as the CAD draughtsman. This may form the basis for any future classification of occupational profiles because it avoids the over-simplification and arbitrary fitting of occupations into stratified hierarchies. Instead jobs could simply be identified in terms of their possession of a number of different skill dimensions, without necessarily having to compress their skill and task configurations into an overall rank order.

On the other hand, if such an ordering was necessary, for administrative or data-collection purposes, then we would recommend that 'task complexity' be the criterion since this is the nearest possible guide to other relevant criteria such as independent planning of work. Task complexity should be interpreted in terms of a balance between skills grounded in theoretical knowledge and those based on 'Technik'. From this perspective the 'ideal type' of multi-skilled job would be technical-practical skills.

However, the foregoing analysis also provides a more radical methodological conclusion. It suggests that for purposes of comparative assessment in a period of changing technology and work organization, national occupational titles should cease to be the main point of reference. Problems of arbitrariness, comparability and the validity of ranking, all of which have been made more complex by recent technological and organizational changes, could be lessened, perhaps removed, if a multi-dimensional skill and competence model were adopted. This would mean designating the essential functions of an industrial process, and identifying and then describing the tasks and skills necessary to carry out these functions into sets of 'families'. A classification of occupations, perhaps taking the form of a directory of European occupations, would then consist of two parts. Firstly, there would be a 'map' of the relevant tasks, skills and competences necessary in a given trade or industry. In the second part the appropriate subsets of these features would then be correlated with the occupational titles used in specific countries and types of enterprise in those countries.

As an illustration of the utility of such a cross-national directory try to envisage the situation of labour mobility in a post-1992 Europe. In any particular instance, employers, unions or other authorities in a given country could use a guide such as this in the following manner. They could identify the appropriate family of task-skills with which they were concerned, and then the classification would indicate the subset of these competences practised by the particular occupation(s) of the country/countries in question. Hopefully, this approach would bring judgements closer to the real world of work and away from that of occupational labels.

A European directory of occupational profiles

Some notes about concepts, methodology and organization

In accordance with the four-year programme and the plan for 1989 CEDEFOP has started to work on the development of a European directory of occupational profiles (Repertoire). This work is at present also closely related to that on the comparability of vocational training qualifications. It involves three major activities:

■ Research on the structure and development of occupations and qualifications in a number of employment sectors in various EC Member States. These studies cover Levels 2 to 4 of the EC classification system and are partly designed to support the comparability project.

■ Analyses of concepts, methods and organizational procedures used for existing national directories. Studies are undertaken in all EC Member States and in addition, contacts have been made with other countries and institutions where similar work has been done (Canada, Sweden, ILO). CEDEFOP has taken up direct contacts with a number of EC countries, such as France (CEREQ) Italy (ISFOL), the United Kingdom (National Council of Vocational Qualifications) and the Netherlands (Stichting Opleiding Metaalindustrie).

■ Development of a dual pilot project for establishing a methodology and a procedure to elaborate the European directory of occupational profiles. This pilot project will first of all be based on the results of the studies undertaken in the metal industry and using a first analysis of national directories. (Later the results of the studies from the office sector will also be included.) Secondly, this concerns the analysis of the contents of occupations in the electronics sector which focuses especially on the know-how required by these occupations (see annex to this chapter).

Peter Grootings
Coordinator of the CEDEFOP project 'Directory of occupational profiles and development of a database'

SALLY & RICHARD

The main problems for developing the directory are at present:

■ To develop a sound conceptual basis which will allow the directory to realize its principal aim: to provide for an information instrument for all parties concerned on the European labour market with respect to competences acquired by job seekers, on the one hand, and competences asked for by employers, on the other, and which can also be used by vocational training authorities in each country.

■ To develop a methodology for collecting substantive information on occupational profiles from the EC member countries and for updating this information on a regular basis.

■ To develop a format for presentation and actual use of the directory by the social partners in all member countries.

With respect to the concept of a European directory of occupational profiles we are faced with the situation that in principle the usefulness of such an instrument is widely acknowledged both nationally and internationally. Several Member States have started similar activities or have already established national directories. A first analysis of existing national directories shows that they differ considerably with respect to their conceptual design.

At the EC level we have the experiences with Sedoc, and with the procedures established for comparability of vocational training qualifications, including the classification into five levels of qualifications (1985 Council Decision). The ILO is working on the renovation of its International Standard Classification of Occupations (ISCO 1988) implying amongst others a new structure of classification based on a combination of sectoral and hierarchical distinctions.

For us, when developing a European directory this implies that we have to take account of the past experiences (negative and positive ones) of all similar approaches (including Sedoc and comparability procedure), and, in addition, to stay as close as possible to the conceptional characteristics of existing national and international directories.

There are a number of questions that have to be answered here.

These concern:

The system of classification

Should we use traditional sector distinctions (such as done by Sedoc and ISCO 68)?

The problem here is that the distinctions between employment sectors become blurred (for example logistics and transport) and that the number of occupations are truly transversal, that is they can be found in a number of different sectors (such as various administrative occupations or those in maintenance).

Should we follow the logic of correspondence in distinguishing five levels of qualifications?

The problem is that similar occupations are given different levels in EC countries as a result of a whole set of societal factors. In addition, recent developments in organization of work have led to occupational profiles that no longer fit into the five levels of qualifications distinguished in the 1985 Decision: vertical distinctions between Level 2 and Level 3 occupations become blurred, new types of occupations occur that are somewhere between Levels 2 and 3; and, finally, we think that the very logic behind the five distinct levels is only valid for a particular type of production and its related employment relations and occupational structure (a mixture of craft and mass industrial production) which becomes slowly superseded by another type of production in some of the most advanced industries and countries.

Should we use a combination of traditional sectors with levels of qualifications (such as developed by ISCO 88)?

Here, the problem is that while the ISCO classification is certainly more comprehensive and up to date compared to the Sedoc list, the distinction made in levels of qualifications is too rough and the descriptions of distinct occupations too general to be immediately useful as an alternative.

Should we forget about traditional sectoral distinctions and choose another category of analysis as has been done in various national directories, such as 'professional areas' (ISFOL), 'major categories of activities' (Government of Quebec)?

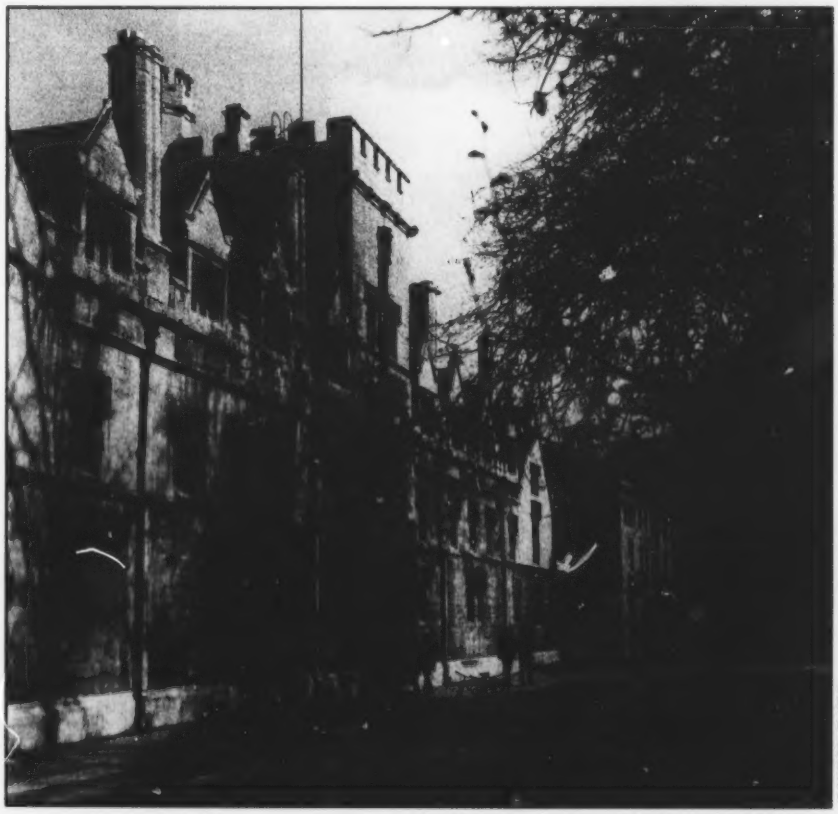
The problem here, as indicated by the various examples, is that each national directory seems to use its own specific concept. What they have in common though, and this would be useful to consider in more detail by us, is that they have chosen a functional area of work as the major classification unit, which is characterized by the fact that the activities and tasks to be executed are logically related to each other in terms of their contents and clearly distinct from activities and tasks to be executed in other functional areas. Such a functional area of work is, for example, 'metal production' or 'usage of information technologies' or 'mechanical maintenance'.

Obviously, such functional areas are defined on a rather general level of abstraction. For this reason most national directories make a further distinction as to 'employment types', 'typical functions', 'professional families', etc. In metal production, for example, professional families cover those of 'machine tool operators', 'drawers', etc.

The level of analysis, comparison, presentation

Should we use the category of 'occupation'?

As mentioned above, occupations have a very societal definition, and their contents also change over time, depending on technological and organizational changes and developments in industrial relations and education. At the same time, one should realize that in each country very specific understandings exist about the definition of occupations. The fact that they are not directly comparable (as we know from our experiences with the procedure for correspondence) does not mean that we can neglect their existence.



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Should we use the category of 'task activities'?

When occupations can be regarded as specific combinations of task activities, it certainly makes sense to use this category. However, from a practical point of view this does not seem useful because the number of separate task activities for each functional area can be very large. For this reason it seems appropriate to choose a level of analysis somewhere between that of occupations and task activities.

We would therefore suggest using the category of 'modules of task activities'.

This concept can be found in several of the national directory approaches and groups together sets of activities that can be conceived as a basic task. The advantage of the module-concept is that it usually is also translated (or can easily be translated) in terms of 'competences' (theroretical and practical know-how, and social or attitudinal requirements).

In fact, a number of countries have already started to organize their vocational training systems in terms of modules and we will be able to draw on the experience and expertise available in these countries.

In general terms, therefore, the concept of a European directory of occupational profiles seems more or less clear.

It will use as its main classification criterion 'functional areas of work' and will further distinguish so-called 'occupational families'. This is a sufficient level of generality to abstract from specific national occupational titles but at the same time makes it possible to 'locate' or 'map' national occupations.

■ The level of analysis/comparison/presentation will be 'modules of tasks' with respect to 'modules of competences'. This will make it possible to analyse and compare the basic contents of national occupational titles and — eventually — also the basic contents of vocational training certificates (the latter assumes the possibility that national training certificates can indeed be broken down in terms of modules of competences). Note that such an analysis only concerns 'what' has been taught and not 'how' this has taken place (organization of learning, duration, pedagogical principles).

With respect to methodology, that is to say the question as to how to collect the information necessary to give body to the directory, there are a number of principles that we wish to adapt:

SALLY & RICHARD

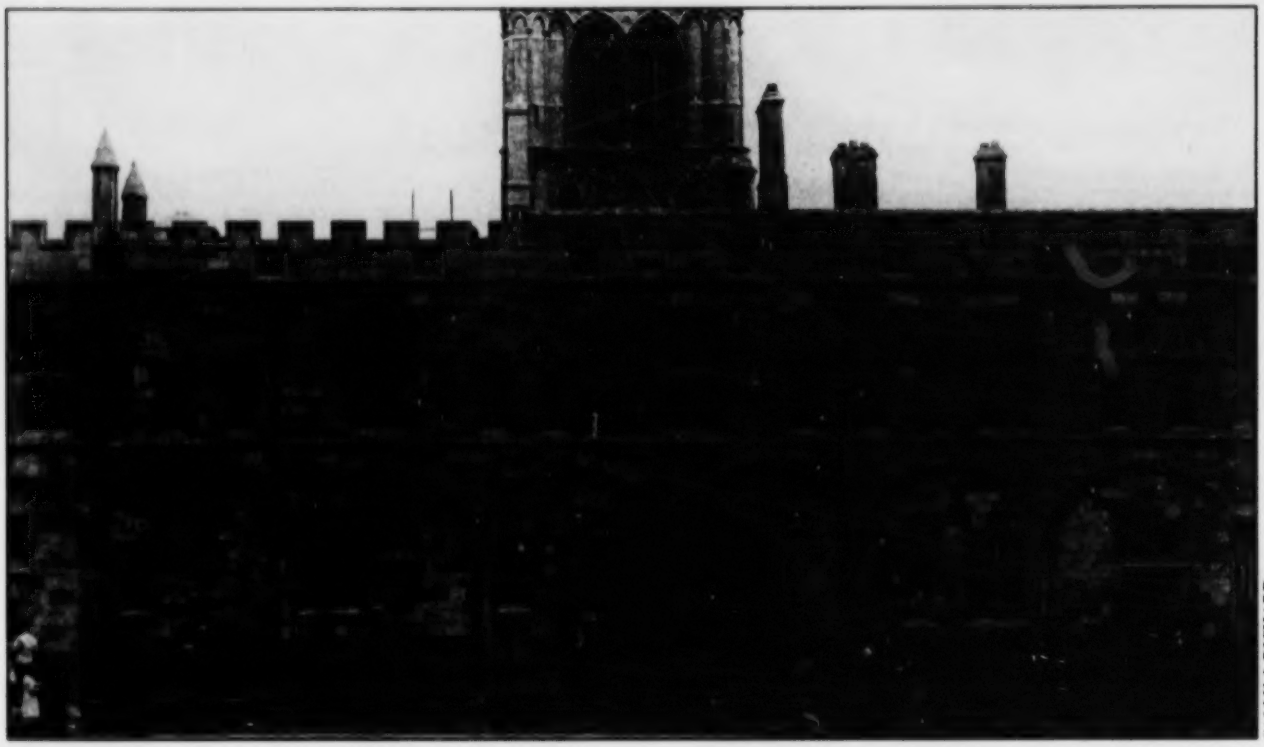
■ to make use of available expertise in the Member States;

■ to separate the 'analytical' work with respect to the analysis of occupational families from decisions as to where to locate national occupations and certificates and from considerations with respect to their mutual recognition;

■ to use national experts to 'locate' national occupational titles and certificates within the more general framework of functional areas of work, professional families and modules of tasks and competences;

■ to leave the responsibility with respect to recognition of available competences to decentralized institutions of social partners who may use the directory as a help in their decision-making process.

An operational methodology will be elaborated from June until October 1989, on the basis of the results from the national and comparative studies in the metal industry and the experiences with the study on occupations in the electronics sector. Information from the series of studies on national classification systems will be used as well. In addition, in this phase, meetings will be organized



SALLY & RICHARD

on a bilateral basis with those national institutions that are most advanced with respect to the development of national directories.

The steps to be undertaken are the following:

■ A final comparative analysis will be made of the national studies in the metal industry. The analysis will result in distinguishing the major 'functional areas of work' in metalworking across Levels 2 to 4 of the 1985 Decision. The analysis will also result in a preliminary model of core tasks and competences, including the corresponding occupational titles for each country.

■ A more systematic analysis will be made of a number of national approaches. Results of this analysis will be combined with the results of the comparative analysis mentioned before.

We shall discuss how to incorporate new metal occupations that have not yet been included in present occupational classification systems.

■ With the assistance of a limited number of experts we will next test and improve the translation of core functions/tasks into competences. The experts involved here will have to have experience with the establishment of modules of competences (October).

■ National experts will then have to check the relevant national occupational titles for each functional area of work or for each occupational family (and eventually the existing vocational training certificates) (November).

■ A similar exercise will be organized with the study on occupations in the electronics industry.

■ This will have to result, before the end of this year, in a model directory and a model methodology.

■ After appraisal of these models, working procedures for all other functional areas of work and their relevant occupational families will have to be worked out. A plan has to be made for work during the coming years (the aim is to finalize the work before 1993!).

■ It is expected that final results for occupational families of the metal sector will be available by the beginning of 1990.

By that time much more can be said also with respect to the format of presentation.

For the moment, all that is clear is that for each 'functional area of work' four separate columns of information will have to be presented:

1. A listing of the core tasks that can be distinguished for the various occupational families that together form a functional area of work;

2. A translation of these core tasks into modules of competences;

These two parts form the general frame of reference for the other parts which are country specific.

3. The 'location' or 'mapping' of relevant occupational titles per occupational family, per country;

4. The presentation of national certificates or other proofs of competency with respect to the modules of competences that are covered by them.

This information can be provided in various formats, ranging from written information sheets (for which various graphical possibilities exist) to a comprehensive system of computerized data banks (which can be set up on a centralized or a decentralized basis). The exact implications of specific choices will have to be elaborated further before the most ideal proposal can be made.

Study of occupational profiles in the electronics sector

(Pilot study: Spain)

Characteristics of the occupational profiles in electronics

Development of the typical profile

Until a few years ago occupations in the electronics sector almost exclusively involved operations which required a great deal of dexterity and manual skill, which meant that the qualification required to carry out this work did not rise above the basic levels. It was not necessary to know anything about electronic systems in addition to the concrete aspects directly related to the activity.

In most cases the work consisted of welding components, preparing circuit diagrams for printed circuit boards with conventional drawing techniques and carrying out tests with machines which were very similar to one another.

The emergence of integrated circuits considerably increased the complexity of the machinery. Also, its integration in systems with many interrelated functions, both analogue and digital, meant that the electronics technician had to know a great deal about hardware.

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When the microprocessor, the central unit of a computer integrated in a circuit, appeared, the electronics technician had to enter the world of software. A world which was completely alien to his habitual work environment and which, up to then, had been almost exclusively associated with administration and management tasks — the traditional fields in which computer technology had been introduced.

Software and the massive application of digital techniques have transformed the work of the electronics technician, making it necessary for him to have an occupational profile with a broad base of theoretical and instrumental knowledge, with the ability to adapt to the permanent changes in technology which has been developing at a headlong pace with respect to quantitative aspects (bits, mips, size of memory, clock rate, speed of transmission, etc.) but not with respect to the basic configuration of a 'programmable system' and the techniques required to apply it.

To a greater or lesser degree logic, algorithms, the step-by-step description of a process through instructions, has replaced the installation of isolated electronic machines for each operation. This change has mostly had a decisive impact on the skilled workers involved in the development of products, but it has also been felt at all other levels. The general spread of systems based on microprocessors has had a galvanizing effect in many areas such as maintenance, production, quality control, etc. where the essential requirement is the global understanding of a process, of the interrelationship between its elements, of the software controlling it.

This development which tends to concentrate the complexity, the specificity and the value of a product in the software, while the hardware is being simplified (in terms of a smaller number of components) and standardized, is reflected in the relative value assigned to various job profiles by the labour market.

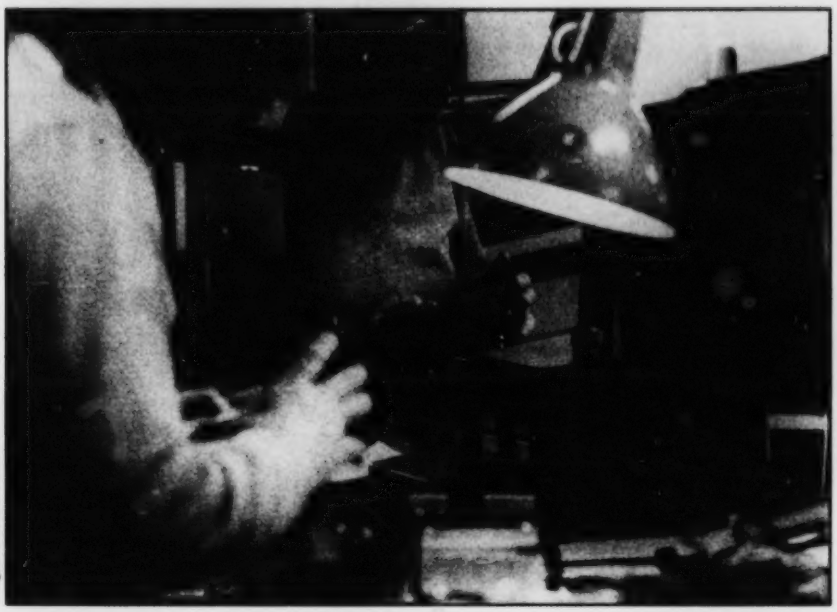
There is a steady growth in the demand, the status and the opportunities for skilled workers with a sound basic and vocational training, capable of adapting to the frequent change in products and/or instruments, while the demand for specific manual skills is declining because of the progressive automation of the conventional operations of assembly, welding, testing, etc.

The requirements at the levels described in the job profile tables are practically entirely covered by technicians with second-level vocational training and frequently by technical engineers who come from the telecommunications or industrial schools, though logically speaking, the movement of the latter towards the higher echelons of responsibility is much faster than that of the former.

This is the job profile most frequently demanded by industrial firms and the public services in Spain, but the vocational training schools are not training sufficient numbers of technicians to cover this demand, which means that the mobility between firms of professionals with experience in electronics is very high.

This mobility is mostly to be found in small and medium-sized enterprises where the technician has to carry out highly diversified activities which give him a broad range of knowledge and make it easier for him to adapt to the new environment. In the large electronics firms the functions in each process are more narrowly defined and the experience acquired is less general, which means that the movement of technicians to other firms is less pronounced.

The situation in firms in the non-electronics sectors — as far as technicians in electronics and industrial information processing are concerned — has its own



Jürgen Bindrim/LAIF

specific features but is not very different as, in the course of carrying out his functions of maintenance and optimization of advanced automatic equipment, the electronics technician acquires sound knowledge of the technology and methods of preventing breakdowns — knowledge which is very much in demand at present in industrial companies in all sectors.

The electronics industry

The design and manufacture of integrated circuits is beginning to become an area of growing and spreading importance, but the study did not dwell on these activities as it felt that they still lie outside the scope of the immediate goals of the majority of the firms in this sector in Spain. In the few firms which deal with the design of 'custom' or 'semi-custom' circuits, this work is almost exclusively done by higher-level engineers, and it has therefore been left out of our study. Also, the manufacture of these microelectronic products is not important enough in quantitative terms to justify its inclusion in a global analysis like this one.

Up to now, the foundation of most activities in the Spanish electronics enterprises, large and small, has been the manufacture of equipment based on printed circuit boards which assemble conventional components, but there is increasingly frequent use of large-scale intregration components such as microprocessors, microcontrollers and associated peripheral circuits.

The general design and manufacturing cycle of this type of product is shown schematically in Figure 1. Using conventional methods (first column of Figure 1), after the functional specifications have been drawn up (1), a circuit is developed on paper (2) and sent to the drawing section (3) which produces the standardized documentation and designs the circuit board (5). After this it is assembled (6) and tested (7); errors, if any, are corrected by means of several process runs. In the testing phase the technician uses general or specific instruments to detect faults or errors, e.g. multimeters, oscilloscopes or logic analysers, other analysers, etc.

The central column of the diagram shows the use of an automated method for the design and development of a product.

One may say that even if at present the use of these automated methods (electronic CAD/CAE) is not absolutely widespread, it is foreseeable that it will be in the near future, as its price is now putting it within the reach of even very small firms. The recent emergence of powerful electronic CAD/CAE devices for PC equipment, together with the constant fall in prices and growing supplies, seems to confirm this trend.

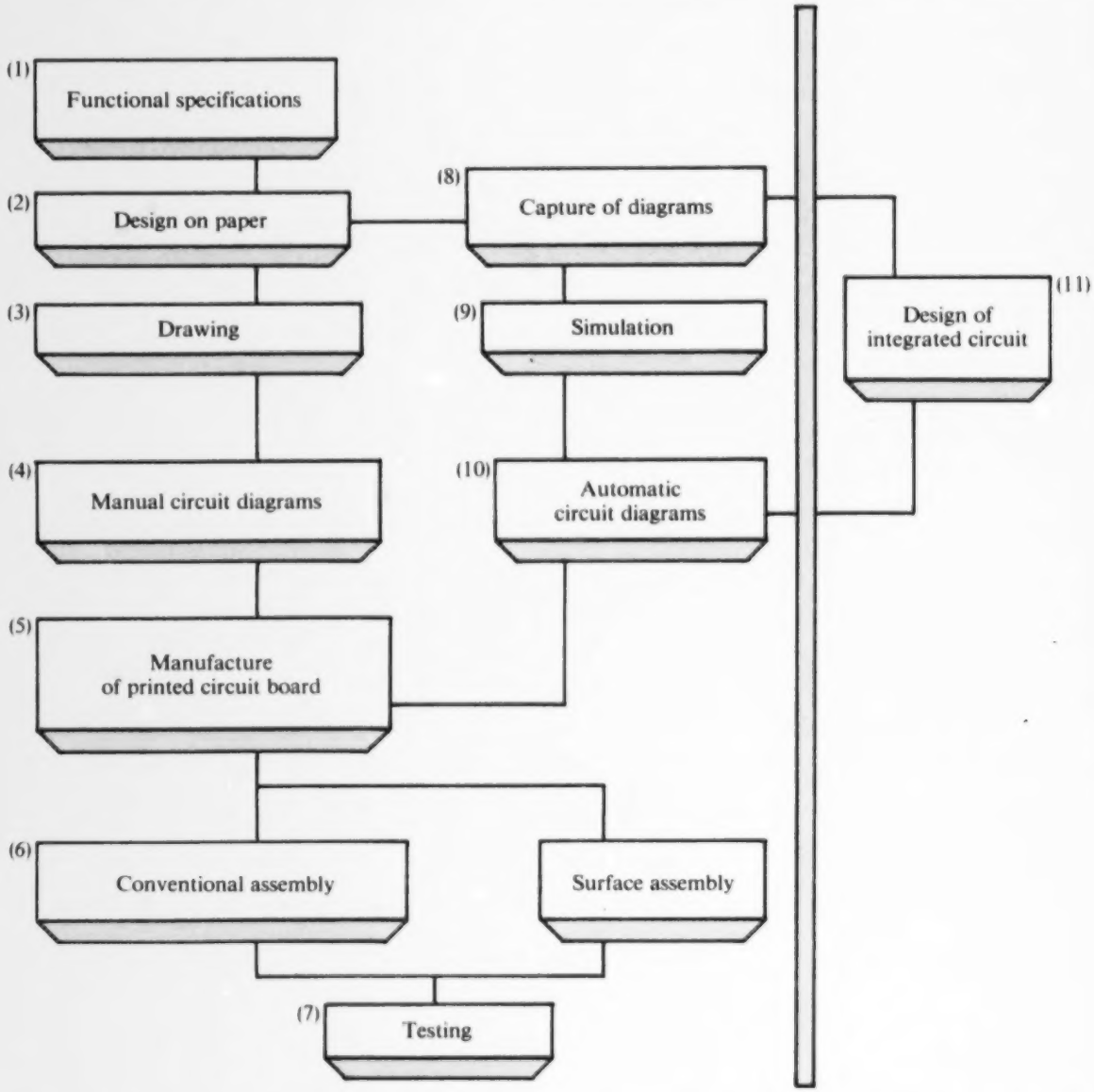
To a certain extent the automatic methods repeat the same steps as the manual methods. The diagrams are captured and used for the production of standardized documentation, and the tracing module then prepares the design of the printed board. But there is one additional feature which is very important, i.e. simulation. Today, with some of the software available on the market, the terminal or the personal computer can be transformed into a complete laboratory. The circuit is assembled, the signals are applied and the responses are obtained as if oscilloscopes and logic analysers had been used. It is possible to analyse transients and noise and it is possible to replace a component by its equivalent equation. A circuit can be subjected to the worst operating conditions, and the power supply and temperature can be varied, exposing the parameters of the components to minimum, maximum or typical situations. In this way it is possible to detect functional problems or design errors before the circuit is manufactured and, in many cases, without the necessity of constructing a prototype.

At the beginning, when the automatic devices described above appeared, it was common for the senior development engineer to be responsible for practically all development phases of the product, including the capture of diagrams, even though his 'professional' qualifications did not cover this; this was similar to the process which transformed financial analysts and accounting clerks into BASIC programmers when the first personal computers were introduced into firms some eight years ago.

The fallacy that the computer is a working tool only for higher-level technicians has been completely dissipated in the last few years, and today it is medium-level technicians and skilled workers with a certain level of vocational training who mainly handle these tools in the development departments, leaving tasks such as functional definition and some questions of simulation and testing which require greater conceptual comprehension to the higher-level technician.

The same phenomenon seen in hardware is emerging in the creation of software too. In some of the firms visited, skilled workers with vocational training in electronics, working in teams, are responsible for much of the development of the software which is incorporated in electronic products, both in the field of communications and in that of industrial process control. One of the necessities stressed by all those in charge of these development units is that the training of these programmers should not be confined to knowledge of the languages and the techniques of structuring programmes but should cover a broad range of other techniques related to the physical environment of the developed electronic product: digital and analogue interfaces,

Figure 1: Design and manufacture of an electronic product



sensors and actuators, signal processing, process-control techniques, etc. All the managers consulted were in agreement that if the worker has a sound training in electronics, it is easier to teach him the necessary skills in informations processing, whereas the reverse order would lead to worse results.

There is no doubt, except in companies with very large R&D departments, that the normal situation is that there is no clear demarcation between the development of hardware and software, and that technicians generally have to carry out activities requiring knowledge and skills in both fields.

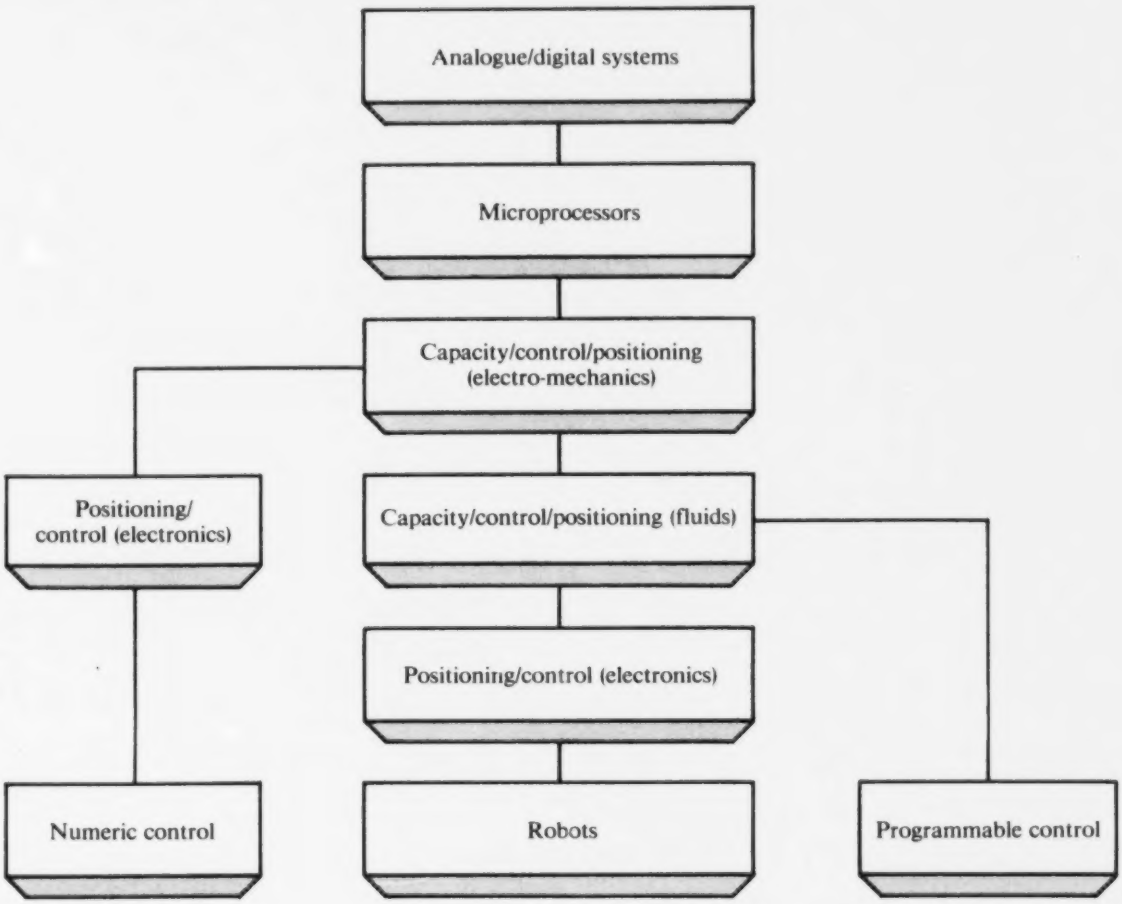
The technical service

In the last few years the maintenance of electronic and data-processing equipment has had to develop at the same pace as the profound technological change which has occurred in machinery and systems.

For instance, in the maintenance of minicomputers, microcomputers and office machinery, the growing sophistication of the equipment with an increasingly larger share of the software component, has necessitated a permanent development of the staff working in the technical service. The maintenance technician in this field is often confronted in his daily work with situations which require a higher degree of abstraction, of knowledge of the machinery as a system and the handling of various software tools.

The maintenance technician today — as against the last few years where the nor-

Figure 2



mal situation was to have computers and software developed by the same manufacturer — is confronted with machines (personal computers in many cases) which function through software application packages developed by other companies for many diverse fields. Furthermore, these computers are, with increasing frequency, being connected to different communications systems in public or private networks where they function as parts of a configuration working with other systems.

In addition to this, the adoption of widely accepted standards (especially in the field of PCs but also increasingly in that of medium-sized computers) now enables users to utilize peripheral and complementary equipment of other makes, different to that of the computer, presuming their compatibility is guaranteed, thus producing configurations of data-processing solutions which are tailored to their specific needs.

For all these reasons, the task of maintaining electronic data-processing and office equipment has become extremely complicated. The act of repairing now involves diagnosis and this can be a very complicated process which requires skills beyond those of handling basic equipment and knowing about a limited number of in-house machines. Today the firms which sell technical services require professional staff whose occupational profiles include a balanced training covering both hardware and software, capable of delivering solutions for users which will re-establish the operating efficiency of the system, and not just enable them to replace cards.

The non-electronics industry

Despite the diversity of the specialized skills in the sample examined, there is still a definite balance in the job structure of the companies manufacturing electronic components. However, this cannot be said of the electronics occupations outside this specific sector.

In the non-electronics sectors the diversity of the size of the enterprises, their specialties, objectives and concrete fields of action, make it difficult to draw up a systematic and homogeneous classification of occupations, functions and profiles.

The automation processes in production are generating a need for technical staff with a sound training in industrial elec-

tronics and informatics. Manipulators, robots, programmable automatic and numerically controlled machines call for specialized workers who cannot only undertake the maintenance and operation but can optimize the functioning of these machines for a concrete situation in a specific manufacturing process and who can adapt them to changes or variations in products.

The growing integration of design in the manufacturing process through the use of computers (CAD/CAM) including the total control of production through computerized tools (CIM), is giving more importance to the role of electronics and informatics technicians. In the concrete case of automobile manufacture studied, there is a department called new technologies which deals with all aspects of support for the automatic systems employed in the production lines.

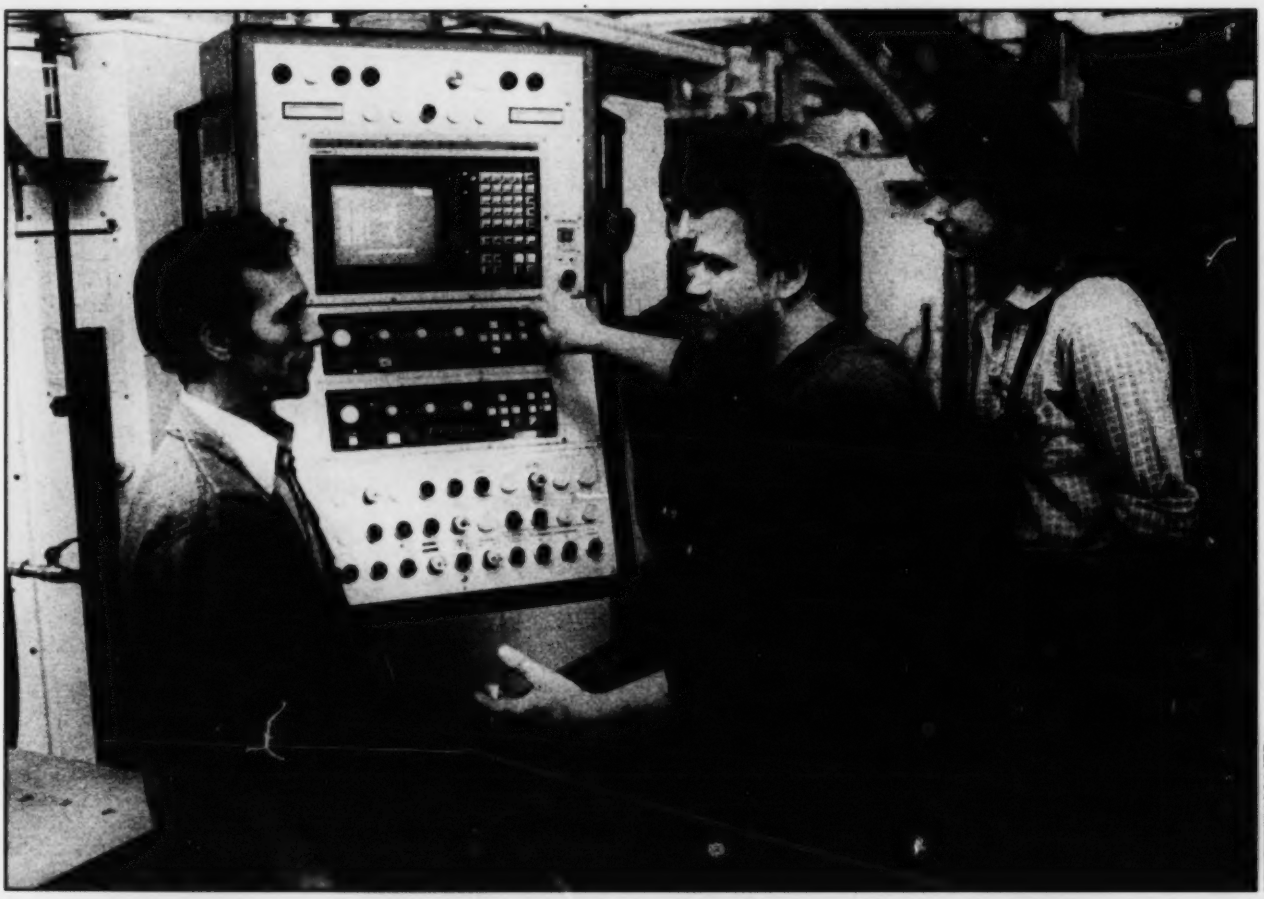
These electronics technicians have an in-depth knowledge of the software for the machines originally supplied by the manufacturers. Their main activity is to develop programmes for extension or modification which will optimize the output of manufacturing systems in terms of time and volume of components obtained at the end of the production line, and for adaptation to partial or total changes in the parameters of the product being manufactured.

One unit of this type also deals with preventive maintenance which is of substantial importance in highly automated systems. One of the tasks undertaken by the electronics technicians is the preparation of studies to improve the reliability of the machines, including the development of specific software for the prevention of breakdowns.

Their function of technical support also includes the task of training the rest of the maintenance staff in more traditional subjects such as pneumatic, hydraulic and electrical systems, etc. as these fields are closely interrelated with industrial electronics and informatics.

The professional electronics employee responsible for support functions in the industrial environment is becoming more of a laboratory employee than a shop-floor operator, spending a large part of his time on self-education — given the rapid evolution of technology — and on optimization studies and forecasts.

Figure 2 gives an outline of the specific training of electronics technicians in an industrial environment such as the one covered by this study.



Manfred VOLLMER

Vocational know-how and skills

Electronics industry

Area: R&D

Job profile: Technical assistant for the development of electronic products

- ☐ General knowledge of electricity
- ☐ Basic instrumentation
- ☐ Active and passive components
- ☐ Analogue and digital circuits
- ☐ Structure of microprocessors and computer architecture
- ☐ Interfaces
- ☐ Peripheral equipment
- ☐ A/D and D/A conversion, transducers

- ☐ Basic software for microprocessors
- ☐ Assembler language, high-level languages
- ☐ Methodology of structured programming

- ☐ Hardware/software integration
- ☐ Development systems for specific instrumentation
- ☐ Emulation

- ☐ Drawing/projection
- ☐ Handling of software for computer-aided design of printed circuits

Area: Production

Production engineering

Job profile: Production technician (support functions)

- ☐ Digital and analogue systems
- ☐ Microprocessor hardware/software
- ☐ Electronic standardization
- ☐ Testing and electronic instrumentation techniques
- ☐ Analysis of production costs

Support functions in production engineering

Job profile: Organization technician

- ☐ Manufacturing methods
- ☐ Optimization of time
- ☐ Programming of automatic systems for insertion and assembly
- ☐ Manufacturing tools

Area: Quality

Job profile: Quality control technician (electronics)

- ☐ Basic electronic technology
  - Passive components
  - Active components
  - Measuring equipment

- ☐ Analogue circuits
  - Amplifiers
  - Filters
  - Signal generators

- ☐ Digital systems
  - Combinatorial and sequential circuits
  - Registers and memory
  - Microprocessors and peripheral circuits

- ☐ Standardization

Non-electronics industry

Area: Support of new technologies

Job profile: Technician for industrial electronics

- ☐ Electro-mechanics
  - Manual and mechanical actuating elements
  - Contactors and relays
  - Tri-phase asynchronous engine
  - Protection and signalling
  - Alternating current receivers
  - DC engines

- ☐ Pneumatic and oleo-hydraulic (fluid) automatic equipment
  - Pneumatic engines
  - Regulation of velocity
  - Regulation of pressure
  - Electro-pneumatic (electrovalve) systems
  - Hydraulic transmission
  - Distributors
  - Flow regulators
  - Function and application of modular electrical and electro-hydraulic elements

- ☐ Control and positioning (electronics)
  - AC/DC, DC/DC and DC/AC convertors
  - Transducers
  - Equipment for control and regulation of output
  - Linear and angular resolvers and positioners
  - Registration devices

- ☐ Robots
  - Architecture and components
  - Kinematics of the system
  - Actuators and sensors

- ☐ Automats
  - Structure
  - Industrial programming
  - Interconnection with peripheral devices

- ☐ Numeric control
  - Technology of CNC machines and tools
  - Planning of trajectories
  - Programming of movements, speeds and auxiliary functions

- ☐ Analogue and digital systems/microprocessors
  - Power supply, amplifiers and signal generators
  - Combinatorial and sequential circuits
  - Registers and memory
  - Architecture of microprocessors and peripheral units
  - Development systems
  - High-level languages

Technical support (data-processing equipment)

Area: Technical support for products

Job profile: Product technician

- ☐ Analogue and digital systems
- ☐ Structure of microprocessors
- ☐ Computer architecture
- ☐ Computer firmware
- ☐ Peripheral units
- ☐ Operating systems
- ☐ Basic communication technologies
- ☐ Teleprocessing
- ☐ Programming languages
- ☐ Application packages
- ☐ Spare parts management
- ☐ Personnel planning and management
- ☐ Product planning

Area: User service

Job profile: Software technician

- ☐ Hardware of microcomputers and other data-processing systems
- ☐ Firmware
- ☐ Operating systems (micros, minis, local networks)
- ☐ Data structure: files, databases, other forms of organization
- ☐ Low-level language (assembler)
- ☐ High-level programming languages
- ☐ Micro/central computer communication. Protocols
- ☐ Application packages in the office environment

Job profile: Maintenance technician

- ☐ General concepts of electricity
- ☐ Measuring instruments
- ☐ Electrical circuits
- ☐ Active components
- ☐ Passive components
- ☐ Power supply
- ☐ Amplifiers. Generators
- ☐ Combinatorial and sequential systems
- ☐ Registers. Memory. Buffers
- ☐ Basic circuitry of the microcomputers: CPU, buses, clock, memory
- ☐ Basic circuits for periphery and I/O control
- ☐ Peripheral units
- ☐ Operating system
- ☐ Software tools
- ☐ Serial and parallel communication
- ☐ Modems: modulation and demodulation

Area: Laboratory/ Maintenance workshop

Job profile: Laboratory technician

- ☐ Analogue and digital systems
- ☐ Power supply
- ☐ Microprocessors and associated VLSI circuits
- ☐ Peripheral units
- ☐ Debugging techniques
- ☐ Special debugging programmes
- ☐ Logic analysers
- ☐ Machine language/assembler
- ☐ Basic I/O programming
- ☐ Interfaces

Type of enterprise

Industrial manufacturing company (Electronics sector)

Area	Group functions	Activities	Occupational titles
Research/ development	Design of circuit boards, documentation and specifications	Testing block diagrams Selection of components Distribution of components to the board Mechanical aspects of the board Circuit diagrams	Technical assistant for development of electronics products
	Software development	Writing programs Interconnection of subroutines Debugging Emulation	*Idem*
	Development and testing of prototypes	Assembly/interconnection of components Maintain software Assembly of circuit boards Mechanical and electrical accessories Preparation of instruments and devices for board assembly Development of software testing	*Idem*

Area	Group functions	Activities	Occupational titles
		Measuring with conventional instruments Automatic testing	
Production	Manufacturing engineering	Analysis of product to be manufactured Conversion of R&D specifications into production parameters	Technician for support functions
		Analysis of the implications of repair, spare parts, costs	*Idem*
		Technical support for testing devices	Technical support assistant
		Support for instrumentation	*Idem*
		Assembly of prototypes	*Idem*
	Production support engineering	Planning of production means for the manufacture of the product	Organization technician
		Analysis of automatic assembly devices	*Idem*
		Programming machines for surface insertion or assembly	*Idem*
Quality	Inspection of product components	Configuration of testing instruments Programming of automatic equipment for testing of components Testing of components	Quality control technician (electronics)
	Testing of completed equipment	Service life tests Functional tests Standardization tests	*Idem*
Industrial manufacturing firm (Non-electronics sector)			
Support of new technologies	Maintenance	Repair and adjustment of electronic and industrial DP equipment Preventive maintenance of machinery	Industrial electronics technician
	Adaptation and optimization of machinery and equipment	Study of optimization of equipment Undertake improvements of equipment Partial or total modification of software Collaboration in the start-up of new installations	*Idem*
Technical support undertaking (Data-processing equipment)			
Technical product support	Promotion and follow-up of product line	Undergo training for the product of the parent company	Head product technician
		Coordinate support functions when product is launched on the market Arrange supply of spare parts according to machine parameters	

Area	Group functions	Activities	Occupational titles
		Give maintenance training to shop-floor technicians	
		Train maintenance technicians and specialized workers	
		Prepare documentation on the product taking account of domestic requirements	
		Function as intermediary between the clients and the manufacturer, informing them of typical, exceptional or design problems	
		Quality control of the product to see whether it conforms to established parameters	
Service for users of data processing equipment	Handle software problems	Talks with the users on the reasons for disturbance Hot-line service	Software technician
		Counselling of maintenance technicians and specialists in questions relating to operating systems, firmware, versions, etc.	
		Deal with problems of interference in soft basic-soft applications, discussing this with external soft houses	
	Maintenance in the field	Install new equipment and machines for clients	Maintenance technician
		Investigate and identify the cause of disorders Remove cause of disorders by changing the module or through adjustment	
		Solve basic software problems Solve unusual problems in specific devices	
		Investigate problems of hard-ware/software interaction	
		Help the user to make efficient use of devices and programmes	
		Adapt equipment from different manufacturers in the client's environment and according to his needs	
Laboratory/ workshop	Repair of equipment sent in by maintenance technicians	Program or alter programs for automatic equipment for the identification of disorders	Laboratory technician
		Repair (or decide not to repair) equipment and components for the product line	
		Carry out measurements and observations with the aid of conventional or special instruments	
		Carry out small simulation programs for testing	

Some reflections on education and training

It is frequently said that the most important foundation for a successful life is provided by the education system, but this poses the question of what education is and what education is not. If someone knows the date of the Battle of Waterloo, and how many wives King Henry VIII had, is that person educated or does he just have a good memory? If education is about regurgitating facts and figures and dates, this is a good preparation for a career following established systems and routine practices. But then, when we come to consider it, this is how most people will spend their working lives. One advantage of being conditioned to following routines is that we can go through life more or less on the equivalent of automatic pilot, both at work and in our private lives. In other words, we only use a small proportion of our potential.

It is an accepted fact in manufacturing that if a job can be standardized, it can be automated and if it can be automated, it can be integrated into a computer-integrated manufacturing system, which either does away with the operator or changes his function completely, but in any case, he is no longer required to carry out what may, in many cases, have been a fairly boring and repetitive job. In other words, the job is so important that a machine can do it; but what has this meant for the employment of the man's full potential capacity in the past, and is it possible to restructure work organization in such a way that the intellectual capacities of the workers can be challenged and utilized, instead of having to carry out a standardized, routine, mechanical function all day?

William G. McDerment

Project Manager
CEDEFOP

With the increasing spread of technological change, the value and advisability of breaking manufacturing or office jobs into components easily managed by people no longer makes sense, since the technologies themselves give much greater scope for the exercise of initiative and reasoning powers than previously possible. In some research projects carried out in relation to the introduction of new technologies in manufacturing, it had been found that the increased potential provided by the technologies has allowed greater scope of action to the employees and increased their level of responsibility, indeed it is often said that much of the managerial authority previously vested in a small section of the hierarchy is increasingly pushed further down the line.

This type of development has far-reaching implications for the way people are educated and trained to enable them to develop their skills to meet constantly changing situations.

The skills will not be seen in the same light as the traditional way in which skills are thought of, but will need to include a range of intellectual and social skills not previously regarded as preparation for most types of work. The intellectual preparation of individuals to manage their lives and careers in an extensive period of unpredictable change has to be laid in the basic education system, in order to provide a firm foundation on which to build further educational and vocational training activities. The days of regarding the vocational training system as the dustbin of the education system, somehow expected to make good the sometimes glaring deficiencies of basic education, must be numbered and a much more integrated approach to the preparation of young people for working life must become a fact and not merely a convenient political statement frequently heard at conferences.

It is often said that our young people are our most precious resource, yet, in some countries, the teachers who carry such a large measure of responsibility for developing the potential of our young people are in many cases overworked and undervalued, not only in terms of social status, but in the financial rewards offered to them. Investing in the training of trainers is a subject which receives much attention in the Member States of the European Community, but investing well in highly qualified and competent teaching staff in schools is of fundamental importance to the development of a well-educated and trained population.

Who needs training?

Vocational training, which is highly organized in some of the Member States, has in other Member States been something of a political football over the past 20 years. It has frequently been difficult to discern a clear, coherent and well-planned approach to the development and delivery of vocational training provision by governments, but during that same period, the subject of vocational training has moved very much towards the centre of debate on social policy and economic issues.

It is often said nowadays that the barriers between vocational training and education are gradually disappearing, but this statement is very rarely followed by practical examples of what is meant. The writer has attended national committee meetings, where representatives from the Ministry of Education and the Ministry of Labour have argued about which Ministry should pay for which part of a particular training programme. Similarly, at a recent conference in one of the Member States, on the subject of the role of education and training in regional development, representatives from the Ministry of Education refused to attend because the conference had been organized by the Ministry of Labour. How long the Member States can afford this wasteful attitude to economic and human resource development is an open question. This type of experience suggests that it is not only the people coming onto the labour market who need training and educating; one of the major log jams to progress in many countries is in the higher levels of the various hierarchies that run the countries and the com-

panies. In other words, further training and retraining of people in various management grades, however they are designated, is an urgent priority since their experience can be rapidly enhanced by investing in fairly short courses of further training; this is one of the most valuable investments that the countries of the European Community can make, since it is on their skill and experience that the employment prospects of millions of people in the Community depend.

The training conference industry

The training conference industry is apparently one of the few growth industries on the national and international scene and has become an integral part of the educator's and trainer's life in the last few years. A merciful cloud of amnesia has descended on some of the more pretentious ones attended; you all know the routine — the conference must be opened by a Very Important Person who will dash in for 10 minutes on the opening morning and say something nice about vocational training and its key importance to the future development of the nation's economy, and it is a subject about which the VIP thinks night and day. The VIP will congratulate the organizers on this wonderful initiative and conclude by reminding the audience that our people are our most precious resource. Everyone will applaud as if they had never heard this before but, if people are honest, they will agree that everyone has said very similar versions of the same thing that people have been saying for the past 10 or 20 years, and that they are now all quoting each other, as if by repetition the words would somehow acquire the power of holy writ, which is not inappropriate, since most of these training conferences consist of people preaching to the converted. The message in general is not getting across to the captains of industry who really have the power to dictate training policy.

Regina Bernes/LAIF

Some of the major conferences have now become so expensive that they must be beyond the reach of many education and training people who are not fortunate enough to have their tickets paid for them by their organizations. Similarly, the costs are certainly beyond the resources of many small and medium enterprise managers, just starting up their businesses, who could no doubt benefit considerably from some of the contributions made at the conferences. In fairness to the organizers, it has to be said that most conferences offer options for attendance on separate days, but this places the participant of limited means in a situation where he has to choose one of the days and hope that the content of the conference on that day will be of direct benefit to him. Admission to exhibitions running concurrently with the conferences is, however, open free to those interested in attending and a great deal of useful contacts and information on the latest developments, particularly with teaching aids, can be obtained from these exhibitions.

A surprising feature of many conferences, including very large and well-organized conferences, is that many speakers still do not use visual aids to brighten up their presentation and reinforce the messages they are trying to put across.

There is, however, a kind of inflationary trend at many of the conferences, where the organizers boast that there will be 2 000 delegates. Even breaking into smaller groups in workshops does not alter the fact that it is very difficult to get down to any serious business at a two or three-day conference with 2 000 delegates. Indeed, smaller group brainstorming meetings attempting to throw up new ideas about training can be much more profitable from a work point of view, but one has to be realistic and accept that even the smallest meetings cost money and that the organizers must cover those costs in order to survive. One has to raise the question, however: is there not a growing surplus of training conferences and are the jumbo con-

Jürgen Bindrim/LAIF

ferences in danger of reaching a point of diminishing return in terms of their practical value to the participants?

Training conferences have their functions, but some attention should be given to developing new approaches and new techniques for putting the messages across, that investing in ongoing training is a matter of enlightened self-interest.

A Europe of the people?

The subject of the social dimension of the internal market is receiving ever greater attention, both at Community and at national level during the past two years and will assume even more importance in the lead-up to the target date for the launching of the internal market in 1992. One of the aims of social policy is to encourage mobility of workers within the Community Member States, but it is doubtful that we shall see a sudden mass movement, like lemmings rushing into the sea. The reality is that the well-qualified and ambitious people will be seeking employment where job prospects, salaries, conditions of employment and the standard of living are much more attractive than on their native heath, but then such people have always been more likely to work in another country than those who have lower-level qualifications.

Much of the talk about the future of employment concerns the need for increasingly higher qualifications to cope with technological change and changes in the world economic order. Governments create new further education and training opportunities in order to help people to prepare themselves for higher qualifications, but experience in the United States of America, for example, indicates that such facilities provided by national and local authorities tend to be utilized by people who are already well-qualified. This means that the gap between the increasingly well-qualified and those with low or no qualifications will become even wider and the risk of polarization of the labour force is something which has to be considered.

In the European Community, for example, there are literally millions of people who have no formal education or training qualifications whatever. All the Member States have, to some degree, an illiteracy problem and estimates for the United Kingdom, for example, suggest that about 10% of the population can be considered functionally illiterate.

In at least one other Member State, something like 30 to 40% of populations in certain localities are either completely illiterate or regarded as being functionally illiterate. Such people are therefore excluded from taking advantage of whatever further education and training facilities are offered by State or local authorities, and the danger of polarization of the labour force between an increasingly highly qualified socio-economic elite and the unqualified or very lowly qualified cannot be ignored.

If we are to create a real Europe of the people, then the needs of those who have no qualifications will have to receive increasing attention for two main reasons: the first one being to give those concerned a chance for economic and social progress through improved opportunities for participation in the economic life of the nation, and the second reason being that without the possession of a recognized qualification, the prospect of free movement of labour within the Community will remain nothing more than a slogan as far as they are concerned.

Preparing for the future

The future prospects for the successful development of the internal market depend entirely on the ingenuity and creative talent of the citizens of the European Community, but how are our education and training systems responding to the potential opportunities beginning to appear on this bright new horizon? Too often, one sees very intelligent and inventive pre-school age children entering what, in many cases, resembles little more than a sausage machine called the education system, only to find them losing their initial inventiveness and enthusiasm for discovery. First impressions of school and the education system cause many people to develop a negative attitude to learning, which lasts throughout their adult working lives because they have come to the conclusion that the education system is designed to produce winners and losers.

Paul GLASER

The future needs of the European Community for a well-educated and trained labour force, which is motivated towards continuing education and training and the acquisition of higher qualifications, can never be achieved if large sections of the population have been conditioned to feel that they have no chance of benefiting from available educational opportunities.

In most countries, employers complain loudly that the schools are not producing the kind of people they need, but one has to question whether it really is the role of the basic education system to train people who are readily employable. No education system can keep up with the rapidly changing requirements of employers, which themselves are by no means uniform.

It is frequently said that people will have to change their careers up to three times during the course of their working lives, and will need frequent retraining and further education. This would demand a degree of flexibility not previously required of individuals and the educational foundation on which training and retraining can be built will become increasingly important in future.

Flexibility and creativity will be the key assets in ensuring chances for a lifetime of employment, and the role of the education system will be to provide a broad cultural background, a sound command of the mother tongue, mathematics, at least one science-based subject and a foreign language. In addition, there should be instruction in problem identification and solving techniques, project work done in teams, report writing, debating techniques and committee procedures, including preparation of the agenda, chairing the meeting and writing the minutes. An introduction to computer-based technology should also feature in the educational programmes and the children should be introduced to this technology in such a way that it is seen only as a tool which can be applied in many different situations.

Education will have to teach people how to learn, to encourage creativity and a flexible attitude to changing situations during one's career, and awaken a lifelong interest in further educational and training possibilities in their various forms. Education and training, however, should not be seen merely as a preparation for a working life, but should contribute to the general cultural development of the individual as a means of improving the quality of life and awareness of the options open to him or her in the working and social spheres.

Research into the problems experienced in companies introducing new technologies shows that those employees who have poor basic education preparation are the most difficult to train and retrain, and are more likely to be faced with redundancy than their better educated colleagues. These research results illustrate the vital importance of the compulsory education system in providing a solid foundation on which people can build further education and training, not only to secure their employment prospects, but to develop themselves as individuals who also have social and cultural needs.

In a Europe of the people, the people are the most important factor and resource and it is on the quality and availability of education and training, on a continuing basis, that the full potential of the internal market and the aspirations of the citizens will be realized.

CEDEFOP
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Contents

I *Acts whose publication is obligatory*

* **Council Regulation (EEC) No 2137/85 of 25 July 1985 on the European Economic Interest Grouping (EEIG)** . . . 1

* **Council Regulation (EEC) No 2138/85 of 25 July 1985 opening, allocating and providing for the administration of a Community tariff quota for deep-frozen fillets of Alaska pollack falling within subheading ex 03.01 B II b) 14 of the Common Customs Tariff** . . . 10

* **Council Regulation (EEC) No 2139/85 of 25 July 1985 amending Regulation (EEC) No 3247/81 on the financing by the European Agricultural Guidance and Guarantee Fund, Guarantee Section, of certain intervention measures, particularly those involving the buying in, storage and sale of agricultural products by intervention agencies** . . . 13

* **Council Regulation (EEC) No 2140/85 of 25 July 1985 on the conclusion of the Agreement in the form of an exchange of letters between the European Economic Community and the Portuguese Republic regarding prepared or preserved tomatoes falling within subheading 20.02 C of the Common Customs Tariff** . . . 14

Agreement in the form of an exchange of letters between the European Economic Community and the Portuguese Republic regarding prepared or preserved tomatoes falling within subheading 20.02 C of the Common Customs Tariff . . . 15

Commission Regulation (EEC) No 2141/85 of 30 July 1985 fixing the import levies on cereals and on wheat or rye flour, groats and meal . . . 16

Commission Regulation (EEC) No 2142/85 of 30 July 1985 fixing the premiums to be added to the import levies on cereals, flour and malt . . . 19

* **Commission Decision No 2143/85 of 29 July 1985 amending for the fourth time Decision No 3715/83/ECSC fixing minimum prices for certain steel products** . . . 21

(Continued overleaf)

Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.
The titles of all other Acts are printed in bold type and preceded by an asterisk.

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No L 199/56 Official Journal of the European Communities 31. 7. 85

COUNCIL DECISION

of 16 July 1985

on the comparability of vocational training qualifications between the Member States of the European Community

(85/368/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 128 thereof,

Having regard to Council Decision 63/266/EEC of 2 April 1963 laying down general principles for implementing a common vocational training policy (1), and in particular the eighth principle thereof,

Having regard to the proposal from the Commission, as amended on 17 July 1984,

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas the eighth principle of Decision 63/266/EEC is to make it possible to achieve the mutual recognition of certificates and other documents confirming completion of vocational training;

Whereas the Council resolution of 6 June 1974 (4) on the mutual recognition of diplomas, certificates and other evidence of formal qualifications requires lists of such qualifications recognized as being equivalent to be drawn up;

Whereas the absence of the said mutual recognition is a factor inhibiting freedom of movement for workers within the Community, insofar as it restricts the possibility for workers seeking employment in one Member State to rely on vocational qualifications which they have obtained in another Member State;

Whereas there is a very substantial degree of diversity in the vocational training systems in the Community; whereas these systems are constantly requiring adaptation to the new situations brought about by the impact of technological change on employment and job content;

Whereas the Council resolution of 11 July 1983 concerning vocational training policies in the European Community in the 1980s (5) affirmed the need for a convergence of policies in the vocational training field, whilst recognizing the diversity of training systems in the Member States, and the need for Community action to be flexible;

Whereas it has been possible for the Commission to establish as a reference point, with the help of the Advisory Committee for Vocational Training, a structure of levels of training which represents a first step towards the achievement of the aims laid down in the eighth principle of Decision 63/266/EEC, but whereas this structure does not reflect all the training systems being developed in the Member States;

Whereas for the skilled-worker level within this structure, and for selected priority groups of occupations, it has been possible to arrive at practical job descriptions and to identify the corresponding vocational training qualifications in the various Member States;

Whereas consultation with the vocational sectors concerned has provided evidence that these results can provide firms, workers and public authorities with valuable information concerning the comparability of vocational training qualifications;

Whereas the same basic methodology could be applied to other occupations or groups of occupations on advice from the Advisory Committee for Vocational Training and with the collaboration of employers, workers and the public authorities in the vocational sectors concerned;

Whereas it is therefore essential to make rapid progress towards the comparability of vocational training qualifications for all skilled workers, and to extend the work to other levels of training as quickly as possible;

Whereas it is advisable to have all the necessary opinions, in particular that of the Advisory Committee for Vocational Training, and the technical assistance of the European Centre for the Development of Vocational Training, and to enable the Member States and the Commission to act in accordance with existing procedures;

(1) OJ No 63, 20. 4. 1963, p. 1338/63.
(2) OJ No C 77, 19. 3. 1984, p. 11.
(3) OJ No C 35, 9. 2. 1984, p. 12.
(4) OJ No C 98, 20. 8. 1974, p. 1.
(5) OJ No C 193, 20. 7. 1983, p. 2.

Whereas the Advisory Committee for Vocational Training delivered an opinion at its meeting on 18 and 19 January 1983;

Whereas paragraph 21 of the report of the Committee on a People's Europe of 29 and 30 March 1985 should be taken into account,

HAS ADOPTED THIS DECISION:

Article 1

The aim of enabling workers to make better use of their qualifications, in particular for the purposes of obtaining suitable employment in another Member State, shall require, for features of job descriptions mutually agreed by the Member States on behalf of workers, within the meaning of Article 128 of the Treaty, expedited common action by the Member States and the Commission to establish the comparability of vocational training qualifications in the Community and improved information on the subject.

Article 2

1. The Commission, in close cooperation with the Member States, shall undertake work to fulfil the aims set out in Article 1 on the comparability of vocational training qualifications between the various Member States, in respect of specific occupations or groups of occupations.

2. The work may use as a reference the structure of training levels drawn up by the Commission with the help of the Advisory Committee for Vocational Training.

The text of the said structure is attached to this Decision for information purposes.

3. The work referred to in paragraph 2 shall first and foremost concentrate on the occupational qualifications of skilled workers in mutually agreed occupations or groups of occupations.

4. The scope of this Decision may subsequently be extended to permit work to be undertaken, on a proposal from the Commission, at other levels of training.

5. The SEDOC register, used in connection with the European system for the international clearing of vacancies and applications for employment, shall, whenever possible, be used as the common frame of reference for vocational classifications.

Article 3

The following working procedure shall be employed by the Commission in establishing the comparability of vocational training qualifications in close cooperation with the Member States and the organizations of workers and employers at Community level:

— selection of the relevant occupations or groups of occupations on a proposal from the Member States or the competent employer or worker organizations at Community level;

— drawing up mutually agreed Community job descriptions for the occupations or groups of occupations referred to in the first indent;

— matching the vocational training qualifications recognized in the various Member States with the job descriptions referred to in the second indent;

— establishing tables incorporating information on:

  (a) the SEDOC and national classification codes;

  (b) the level of vocational training;

  (c) for each Member State, the vocational title and corresponding vocational training qualifications;

  (d) the organizations and institutions responsible for dispensing vocational training;

  (e) the authorities and organizations competent to issue or to validate diplomas, certificates, or other documents certifying that vocational training has been acquired;

— publication of the mutually agreed Community job descriptions and the comparative tables in the *Official Journal of the European Communities*;

— establishment, within the meaning of Article 4 (3), of a standard information sheet for each occupation or group of occupations, to be published in the *Official Journal of the European Communities*;

— dissemination of information on the established comparabilities to all appropriate bodies at national, regional and local levels, as well as throughout the occupational sectors concerned.

This action could be supported by the creation of a Community-wide data base, if experience shows the need for such a base.

Article 4

1. Each Member State shall designate a coordination body, based wherever possible on existing structures, which shall be responsible for ensuring — in close collaboration with the social partners and the occupational sectors concerned — the proper dissemination of information to all interested bodies. The Member States shall also designate the body responsible for contacts with the coordination bodies in other Member States and with the Commission.

2. The coordination bodies of the Member States shall be competent to establish appropriate arrangements with regard to vocational training information for their competent national, regional or local bodies as well as for their own nationals wishing to work in other Member States and for workers who are nationals of other Member States, on established cases of comparable vocational qualifications.

3. The bodies referred to in paragraph 2 may supply on request in all Member States an information sheet drawn up in accordance with the model provided for in the sixth indent of Article 3, which the worker may present to the employer together with his national certificate.

4. The Commission is to continue studying the introduction of the European vocational training pass advocated by the Committee for a People's Europe in paragraph 21 of its report of 29 and 30 March 1985.

5. The Commission shall give the bodies referred to in paragraph 2, on request, all necessary assistance and advice concerning the preparation and setting up of the arrangements provided for in paragraph 2, including the adaptation and checking of the relevant technical documents.

Article 5

The Commission shall, in close liaison with the national coordination bodies designated by the Member States,

— review and update at appropriate, regular intervals, in close cooperation with the Member States and the organizations of workers and employers at Community level, the mutually agreed Community job descriptions and the comparative tables relating to the comparability of vocational training qualifications,

— where necessary, formulate proposals for a more efficient operation of the system including other measures likely to improve the situation as regards the comparability of vocational qualification certificates,

— where necessary, assist in the case of technical difficulties encountered by the national authorities or specialized bodies concerned.

Article 6

Each Member State shall submit to the Commission, for the first time two years after adoption of this Decision, and therefore every four years, a national report on the implementation of this Decision and the results obtained.

The Commission shall, at appropriate intervals, submit a report on its own work and on the application of this Decision in the Member States.

Article 7

This Decision is addressed to the Member States and the Commission.

Done at Brussels, 16 July 1985.

For the Council

The President

M. FISCHBACH

ANNEX

Training-level structure referred to in Article 2 (2)

LEVEL 1

Training providing access to this level : compulsory education and professional initiation

This professional initiation is acquired at an educational establishment, in an out-of-school training programme, or at the undertaking. The volume of theoretical knowledge and practical capabilities involved is very limited.

This form of training must primarily enable the holder to perform relatively simple work and may be fairly quickly acquired.

LEVEL 2

Training providing access to this level : compulsory education and vocational training (including, in particular, apprenticeships)

This level corresponds to a level where the holder is fully qualified to engage in a specific activity, with the capacity to use the instruments and techniques relating thereto.

This activity involves chiefly the performance of work which may be independent within the limits of the relevant techniques.

LEVEL 3

Training providing access to this level : compulsory education and/or vocational training and additional technical training or technical educational training or other secondary-level training

This form of training involves a greater fund of theoretical knowledge than level 2. Activity involves chiefly technical work which can be performed independently and/or entail executive and coordination duties.

LEVEL 4

Training providing access to this level : secondary training (general or vocational) and post-secondary technical training

This form of training involves high-level technical training acquired at or outside educational establishments. The resultant qualification covers a higher level of knowledge and of capabilities. It does not generally require mastery of the scientific bases of the various areas concerned. Such capabilities and knowledge make it possible in a generally autonomous or in an independent way to assume design and/or management and/or administrative responsibilities.

LEVEL 5

Training providing access to this level : secondary training (general or vocational) and complete higher training

This form of training generally leads to an autonomously pursued vocational activity — as an employee or as self-employed person — entailing a mastery of the scientific bases of the occupation. The qualifications required for engaging in a vocational activity may be integrated at these various levels.

List of organizations supplying information in each Member State

Belgium:

Ministère de l'Éducation nationale
CAE Arcades — F 6024
Bd Pachéco, 19, Bte 0
B—1010 Bruxelles
Tel.: 02/210 57 88

Ministère de l'Emploi et du Travail
Rue Belliard 51-53
B—1040 Bruxelles

Ministère des Classes moyennes
World Trade Center — Tour 2
Bd Em. Jacqmain 162
B-1000 Bruxelles
Tél.: 219 41 50

Office national de l'Emploi
Bd de l'Empereur 5
B-1000 Bruxelles
Tél.: 515 41 11

Ministerie van Onderwijs
Koningstraat 138
B-1000 Brussel
Tel.: 02/211 46 40

Het Ministerie van Tewerkstelling en Arbeid
Belliardstraat 51-53
B-1000 Brussel

De Rijksdienst voor Arbeidsvoorziening
Keizerslaan 7
B-1000 Brussel
Tel.: 515 41 11

Ministerie voor de Middenstand
World Trade Center — Toren 2
Em. Jacqmainlaan 162
B-1000 Brussel
Tel.: 219 41 50

Denmark:

Undervisningsministeriet
Direktoratet for Erhvervsuddannelserne
Højbro Plads 4
DK-1200 København
Tel.: 33 92 56 00 Fax: 33 92 55 47

Federal Republic of Germany:

Bundesministerium für Bildung und Wissenschaft
Stresemannstraße 2
D-5300 Bonn 2
Tel.: 02 28/57 21 35 Fax: 0228 57 20 96

Bundesanstalt für Arbeit
Regensburger Straße 104
D-8500 Nürnberg 30
Tel.: 09 11/1 71 Fax: 0911 17 21 23

Ständige Konferenz der Kultusminister der Länder in der BR Deutschland
Zentralstelle für ausländisches Bildungswesen
Nassestraße 8
D-5300 Bonn 1
Tel.: 02 28/50 11

Deutscher Gewerkschaftsbund (DGB)
Hans-Böckler-Straße 39
D-4000 Düsseldorf 30
Tel.: 02 11/4 30 11

Bundesvereinigung
der Deutschen Arbeitgeberverbände (BDA)
Gustav-Heinemann-Ufer 72
D-5000 Köln 51
Tel.: 02 21/3 79 50

Greece:

Ministère de l'Éducation nationale
Mitropoleos, 15
GR-10185 Athènes
Tél.: 301/32 37 353 Fax: 32 25 259

Spain:

Ministerio de Educación y Ciencia
Subdirección General de Ordenación Académica
Calle los Madrazo, 15-17
E-28040 Madrid
Tel.: (341) 522 11 00 Fax: 521 37 75

Ministerio de Trabajo y Seguridad Social
Instituto Nacional de Empleo
Subdirección General de Gestión de Formación Profesional
Calle Condesa de Venadito, 9
E-28027 Madrid
Tel.: (341) 585 98 65 Fax: (341) 268 39 81/82

France:

Délégation à la Formation professionnelle
50/56, rue de la Procession
F-75015 Paris
Tél.: 33 1 48 56 48 56 Fax: 48 56 49 30

Centre INFFO
Tour Europe, Cedex 07
F-92080 Paris la Défense
Tél.: 47 78 13 50 Fax: 47 73 74 20

Ireland:

Department of Labour
Mespil Road
Dublin 4
Ireland
Tel.: 1-765861 Fax: 603 210

FAS — Training and Employment Authority
Upper Baggot Street 27-33
Dublin 4
Ireland
Tel.: 1-685777 Fax: 68 26 91

Italy:

Ministerio del lavoro e previdenza sociale
Via Castelfidardo 43
I-00183 Roma
Tel.: 6-4040 368 Fax: 4040 368

ISFOL
Via Bartolomeo Eustachio 8
I-00161 Roma
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Luxembourg:

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Service de la Formation professionnelle
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L-2926 Luxembourg
Tel.: 46 802 463 Fax: 46 802 573

Administration de l'Emploi
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L-2340 Luxembourg
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Chambre de Commerce
7, rue Alcide De Gasperi
L-1615 Luxembourg
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Chambre des Métiers
41, rue Glesener
L-1631 Luxembourg
Tél.: 48 80 51 Fax: 49 23 80

Chambre d'Agriculture
B.P. 1642
L-1016 Luxembourg

Chambre des Employés privés
13, rue de Bragance
L-1255 Luxembourg

Chambre de Travail
18, rue Auguste Lumière
L-1950 Luxembourg

Chambre des Fonctionnaires et Employés publics
11, avenue de la Porte-Neuve
L-2227 Luxembourg

Netherlands:

COLO — Centraal Orgaan
van de Landelijke Opleidingsorganen
Promenade 329
NL-2701 AG Zoetermeer
Tel.: 79-42 56 99 Fax: 79-42 71 55

Portugal:

Instituto do Emprego e Formação Profissional
Rua de Xabregas 52
P-1900 Lisboa
Tel. 8584701 Fax: 8585562

United Kingdom:

Training Agency
Qualifications and Standards Branch
Moorfoot
Sheffield S1 4PQ
United Kingdom
Tel.: 742 59 41 23 Fax: 742 75 83 16

Confederation of British Industry
Centre Point
London WC1A 1DU
United Kingdom
Tel.: 1-3797400

Trade Union Congress
Great Russell Street
London WC1 3LS
United Kingdom
Tel.: 1-6364030

Department of Economic Development
Nether Leigh
Massey Avenue
Belfast BT4 2JP
United Kingdom
Tel.: 232 63244

Scottish Education Department
New St Andrews House
Edinburgh EH1 3SY
United Kingdom
Tel.: 31-2444527

Association of Metropolitan Authorities
35 Great Smith Street
London SW1P 3PJ
United Kingdom
Tel.: 1-2228100

Convention of Scottish Local Authorities
Roseberry House
9 Haymarket Terrace
Edinburgh EH12 5XZ
United Kingdom
Tel.: 31-3461222

Association of County Council
Eaton House
66a Eaton Square
London SW1W 9BH
United Kingdom
Tel.: 1-2351200

National Council for Vocational Qualifications
222 Euston Road
London NW1 2BZ
United Kingdom
Tel.: 1-3879898

Business & Technician Education Council
Tavistock Square
London WC1H 9LG
United Kingdom
Tel.: 1-3874141

Scottish Vocational Education Council
Hanover House
24 Douglas Street
Glasgow G2 7NQ
United Kingdom
Tel.: 41-2487900

Royal Society of Arts
8 John Adams Street
Adelphi
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One just like the other?

Of some things it is said that they are the spitting image of each other. The same occupational descriptions in the Member States of the European Community still, however, conceal different requirements, fields of activity, diplomas, certificates and training paths.

Who knows whether an applicant has the right qualification, how to formulate a job description or what occupations a qualification ensures access to in other European countries.

Information on subjects of this kind is provided by the communications of the EC Commission in the Official Journals of the EC. They offer:

- *detailed comparative overviews on vocational training qualifications:*
  - *occupational descriptions,*
  - *descriptions of vocational training qualifications,*
  - *the offices responsible for issuing certificates,*
  - *institutions which provide training*
- *descriptions of mutually agreed practical occupational requirements:*
  - *descriptions of general fields of activity*
  - *and individual activities.*

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The national distribution sources are listed on the previous page.

Moreover, employers and employees can obtain information sheets from the national offices listed from page 44 onwards.

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